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BRITISH SHIPPING

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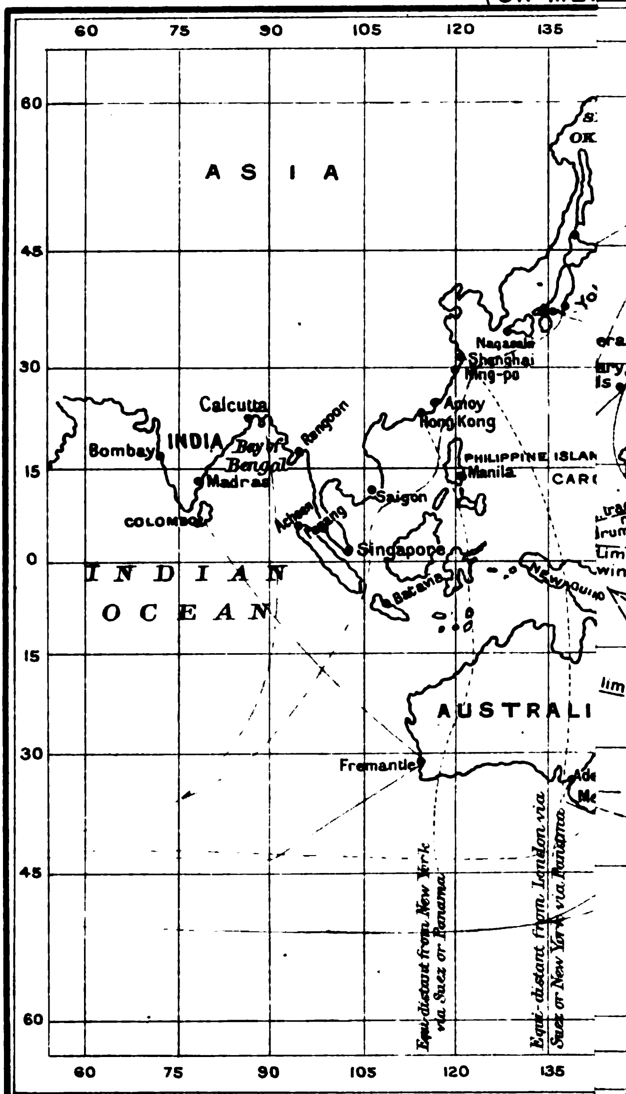

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BRITISH SHIPPING

ITS HISTORY, ORGANISATION AND IMPORTANCE

BY

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WITH A MAP OF MAIN ROUTES AND COALING-STATIONS, AND FULL APPENDICES

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TO

MY OLD FRIEND

CAPTAIN THOMAS YOUNG

IN MEMORY

OF MANY PLEASANT DAYS SPENT ON BOARD THE

CITY OF AGRA, *ESSEX*, AND *AJANA*

PREFACE

This series of books "is designed to give a succinct account of the present position of National Industries in national and international trade, the effects of Government regulations, foreign tariffs, foreign competition, and the rivalry of other branches of production which offer alternative commodities or services to the consumer."

To write an essay on British Shipping bearing all these points in mind was no easy task to undertake, especially when the length of the book was necessarily limited. But the writing of the book has been a great pleasure for many reasons. One's interests from early boyhood have been connected with the sea and ships, thus the work entailed a review of many past years, and the recollection of many interesting experiences. Moreover, in making oneself familiar with the latest phases of the industry it has been necessary to visit ships, ports and docks, and to interview, or correspond with, those who are in authority. The kindly courtesy with which questions, both oral and written, have been answered, merits more than the mere expression of thanks.

I am especially indebted to the following Gentlemen and Corporations for assistance, and for permission to use material:—

Lloyd's, who allowed me to reprint from their

Calendar the Tracks of Atlantic Steamers, and the Sailing Ship Records, which had been very carefully compiled by Mr Basil Lubbock, who through Lloyd's expressed his pleasure that his tables should be printed in this book.

Lloyd's Register of British and Foreign Shipping, who placed their valuable reports at my disposal and gave me permission to publish any parts that might be necessary.

The British Corporation for the Survey and Registry of Shipping, who furnished me with information as to the origin, development and present work of their institution.

The Suez Canal Company, who not only sent me their printed reports, but assisted in drawing up the table printed in the appendix.

The *Authorities* of the following Ports and Docks were especially courteous in sending me their reports and balance sheets, and in replying to questions :— London, Liverpool, Glasgow, Manchester, Bristol, Cardiff, Newport and Swansea.

The Editor of *Fairplay* most readily consented to the reproduction of the diagrams which had been prepared for his Journal, and thus are among the appendices of this volume. I have also for some time past made a practice of reading the leading shipping papers, and would take this opportunity to acknowledge my indebtedness to *Fairplay*, the *Shipping World*, and *The Syren and Shipping* for much information that might have otherwise escaped my notice. Lastly, but by no means least, am I indebted to many friends with whom I have discussed the shipping questions of the hour. Foremost amongst these is the old friend to whom I have dedicated this volume.

For all mistakes or slips, and there are probably many in a book like this, I take all responsibility. I shall gladly receive from readers any corrections or suggestions on points where they feel that a correction or modification should be made.

It had been intended to include in this book a section on the general subject of the labour connected with the shipping industry. It was found, however, that doing so would have increased the volume to almost unwieldy dimensions. The subject may, however, be dealt with in another essay at no very distant date.

A. W. KIRKALDY

BIRMINGHAM, *May* 1914

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BOOK I

THE EVOLUTION OF THE SHIP

CHAPTER I

THE ORIGIN AND EARLY DEVELOPMENT OF THE TRADING SHIP

THE debt that the world to-day owes to shipping is by no means easy to calculate. We are so accustomed to include the products of far-off countries among the necessaries of life that the facility with which commodities are obtainable, and the cheapness which enables even the poorest to enjoy them, have become a mere commonplace. Yet these comforts and luxuries should be included among the many benefits which a rapidly advancing civilisation has given us. A century ago, the shipping of the world was, for the most part, employed in supplying luxuries solely for the well-to-do members of society, to-day it is the masses of mankind that benefit; our teeming population could be neither clothed nor fed were not foreign supplies obtainable. Were it not for the refrigerating ship, the meat-stuffs of South America and Australasia could not be brought to the English market, and meat, to a great extent, would cease to be the food of the people. If the far-off cornlands were unable to supply us with a vast quantity of cheap corn, not only must our population be greatly diminished, but we should suffer in all our greatest industries, and Great Britain would cease to be the hive of industry with which the world has been so long familiar.

An island with a long coast line, numerous safe harbours and navigable rivers, advantageously placed between the New and the Old Worlds, was designed by Nature to be the home of a great shipping community. Our earliest history speaks of foreign trade, unknown merchants seeking metals, trafficking for tin, very much in the same way as our own seventeenth and eighteenth century navigators traded with the inhabitants of newly discovered countries.

The British coracle, a flimsy craft, capable however of performing extraordinary feats, is the germ whence has evolved the magnificent liner of to-day. Strange though it may seem, some of the technical terms which originated during the coracle epoch still survive. The plating of a modern ship is called technically the *skin*, and this is a survival of the days when hides were stretched over the ribs of the coracle. The joining of the skins was effected by sewing the edges of the hides together and forming a seam. Although a ship's plating is now of iron or steel, and these plates are lapped or butted and rivetted together, we still talk of a ship's *seams*, another very interesting survival from ancient days and primitive methods of construction. These survivals, and the possibility of tracing a direct line of succession from coracle to steel liner, explain the course of shipping history. In common with every industry, shipping has been subject to evolution, nor could a clearer illustration of the working of evolution be conceived. Each new type of ship has been an attempt to improve on what went before. In construction-material, in design, in motive force, improvement has succeeded improvement, nor would any naval architect or marine engineer venture to say that perfection has yet been attained. Large as are the dimensions of the modern leviathan, with a growing volume of trade, it would be unwise indeed to think that the limits as to dimension have been reached. This very year in Belfast the shipyards are preparing slips for building ships one-third larger than the *Olympic* and *Titanic*, and the same policy is being pursued in all yards building big ships. But size is not the only criterion as to the improvement of the ship; speed, safety, comfort and reliability are of much greater importance; and in these directions each year sees changes and developments which are only not remarkable because they are so continuous. If, however, a comparison be made between ships designed and constructed even a few decades ago and those of to-day, the contrast is marked; compare an early Victorian Atlantic liner with the *Lusitania*, and one is astonished by the very great advances that have been made; were one of Columbus's ships and a modern *greyhound* moored together, it would be hard to believe that both had been constructed to cross the same ocean.

The coracle was Celtic, moreover it was small, and its possibilities for trade very restricted. When trading developed, very different craft were devised, and as early as the time of Julius Cæsar, heavily timbered ships appear to have visited the coasts of Britain for trading purposes. Cæsar describes the ships of the Veneti who carried on such trade as then existed. His description probably requires some modification, the pen naturally glides into exaggeration when narrating one's own exploits, and for the Romans—landsmen with the scantiest of naval experience—to tackle successfully the very superior ships of the Veneti, was indeed a feat worthy of note. The ships are said to have been of a great size, and to have stood so far out of the water that the Romans could not well attack them with their usual missiles. They were built of solid oak, the deck-beams were a foot in thickness, and fastened with iron bolts of a gauge equal in size to a man's thumb; the sails were of leather, and the anchors were attached to chain cables. Apparently they depended entirely upon their sails, as Cæsar's tactics consisted in crippling them by cutting the halliards and so rendering the ships uncontrollable. It is very difficult to say whether these ships had any influence on shipbuilding methods, either in the British or Anglo-Saxon shipyards; probably their influence, if any, was very indirect, for English shipping at the time of the Norman Conquest had continued on the lines of the Viking ships, and it was this type that was commonly constructed until the crusading voyages of Richard the First. The Mediterranean brought English sailors and ship-designers in touch with a different type of ship, namely the Venetian Buss. On the Mediterranean two distinct classes of ship had developed—the galley, a craft either propelled by oars simply, or having auxiliary sails—and the ship. The former was long and of no great beam comparatively, whilst the latter was destined to develop into the apple-bowed ship, full and round, capable of carrying a good cargo and facing a heavy sea. This type known as ship, buss, caravel or bark is the direct progenitor of the modern cargo ship. The expeditions of Richard the First taught English sailors many useful lessons, in consequence of which the design of the ship was modified. The fore-castle and after-castle were introduced, though it was to be nearly three hundred years ere the full ship design was to be adopted. The most important change resulting from the voyages to the Levant was, that from being a coaster, or at most a North Sea sailor, the Englishman thenceforward became increasingly adventurous, commencing a training in navigation and seamanship which was to render him the most intrepid of navigators, when, with the discovery of America and the Cape route to the Far East, a world commerce became possible.

Hitherto but scanty justice has been done to Richard the First in this matter. As a result of his knight-errantry new markets were opened up, and a more extensive trade both in imports and exports began. To regulate this growing trade the first modern maritime code of laws was drawn up. The Laws or Judgments of Oléron, as they were called, were intended for the regulation of England's growing mercantile marine. These laws were modelled on the *Book of the Consulate of the Sea*, which regulated the trade and shipping of the Levant, but modified in accordance with the decision of the Court of Oléron, an island forming part of the Duchy of Guienne. They were primarily intended to regulate the growing wine and oil trade between England and Guienne, but have continued to influence maritime law and custom down to the present day.

The first half of the thirteenth century saw English shipping trade developing in many directions, and tending to concentrate in the hands of Englishmen. The effects of the Crusades could be traced in the changes taking place both in the model and fittings of ships. Open decked boats with one mast gave place to decked craft with, at first two, and then three masts. The accommodation for passengers became increasingly comfortable, and sheltered quarters were also provided for the officers and crews under the castles built forward and aft for fighting purposes. Hence it became possible to venture further afield, nor was it long before the result of these new possibilities began to accrue, for Hakluyt[1] tells how an English ship discovered Madeira in the year 1344—about seventy-four years before the Portuguese arrived there. The report of this discovery led the French to make a voyage in the same direction, with the result that not only was Madeira visited, but also the Canary Islands, which hitherto had been unknown to Europe.

Half a century later, during the reign of Richard the Second, the first step was taken in a new policy, as a result of which the Navigation Laws of England were gradually evolved. This was in connection more especially with the export of English coal from Newcastle to the Continent, and the growing continental trade generally—the object being to restrict this trade to English ships and sailors—a restriction which at the time could not be fully maintained.

During this period of history it must not be forgotten that Venice was the great shipping centre of the world. And it was Venetian ships, employed on, what were for those days, long voyages, that increased in size, developed new proportions and modifications in design, whilst at the same time mast and sail, rigging and equipment were also being perfected. These ships passed through the Straits of Gibraltar, and visited English and Flemish ports. The cycle of Venetian trade extended as far westward as London and Antwerp,

[1] *Voyages*, ii. 455.

and continued along the shores of Western Europe, the northern Mediterranean, and the Levant. In paintings still existing these trading ships are shown to be almost modern in their design and equipment; business-like handy looking craft, showing that naval architecture was proceeding along right lines. The visits of such ships to our ports had marked effects, and when, at the end of the Wars of the Roses, political peace made further trading developments possible, it is noticeable that practically all trace of the Viking ship had disappeared, and a hull had been evolved more capable of sustaining a long sea voyage, and with possibilities for still further evolution. In other words a ship capable of going anywhere and doing anything was now but a question of time and the demands of trade.

CHAPTER II

THE EAST INDIAMAN AND THE FREE TRADER

THE reign of Henry the Seventh opened up a new epoch in the annals of shipping. Hitherto trading voyages had been restricted to European waters. It is true that in the middle of the fourteenth century an Englishman, Machin or Macham, is said to have fallen in with Madeira, and that French navigators following in his wake had confirmed his discovery and visited the Canary Islands. The Portuguese, too, had been creeping down the West Coast of Africa, and their greatest navigator, Prince Henry (who by the way had English blood in his veins, being a grandson of John of Gaunt), had come to the conclusion that India could probably be reached by rounding the southern extremity of Africa. At this point another great figure came upon the scene, an Italian, Christopher Columbus, who, after much study and thought, suggested sailing westward instead of southward as a means of getting to India. Europe was feeling more and more the need of trading intercourse with the Far East, but the trade routes opened up by the Venetians by way of the Levant ports and thence overland were threatened by the

Turks; indeed communication in this direction was more than threatened; it was, for a time at least, cut off. It was this that probably gave the first impulse to the exertions both of the Portuguese mariners and Columbus in searching for new and uncontested routes to the Indies.

Columbus received some inspiration from an Englishman, Roger Bacon, who lived during the thirteenth century. Bacon was one of the greatest men of the Middle Ages, being far in advance of his contemporaries as either scientist or scholar. In the fourth part of his *Opus Majus* he discusses the relations of the extreme east and west of the habitable Globe, and speculates at length on the probable proximity of Spain to India. Cardinal Peter d'Ailly in the first quarter of the fifteenth century, wrote a book entitled *Imago Mundi*, and in this he copied nearly verbatim (but without acknowledgment) this section of Bacon's work. There exists a letter written by Columbus to Ferdinand and Isabella of Spain in which he cites this very passage from *Imago Mundi*, as one of the inducements that led him to undertake his voyage across the Atlantic.

Columbus and Vasco da Gama, whether inspired from without or by their own intrinsic genius, opened up the possibilities of world trade. Henceforward the adventurer, by risking long months from home, could secure, if he survived the chances of the sea and all that that entailed, riches in abundance. Such an opening did not wait long before attracting the hardy and venturesome sailors hitherto restricted to European seas, whilst at the very moment the way was thus opened up for making long voyages, shipbuilders succeeded in producing the type of ship required for the purpose.

English shipbuilders had for some time been building ships which would depend entirely upon their sailing powers, and had discovered that English oak was a specially suitable material for ship construction. Thus during the Tudor period, especially under Henry VII. and VIII., shipbuilding in this country made considerable advance. It can hardly be claimed that this new type of ship originated in this country; it was not even a descendant of the Viking ships of our Norseman ancestors, it was really an adaptation of a model in common use in the Mediterranean, found by experience to be suited both as a carrier and a seaboat to cross far-stretching oceans. This is the ship which carried Cabot across to Newfoundland, and then along the eastern coast of North America. The same type of ship with small modifications was sailed by Drake, Frobisher and Raleigh. This vessel, though small, showed a capacity for doing a variety of work in many parts of the world. But when compared with the ships of other maritime countries, the English ship was not at first entirely satisfactory.

There is a pamphlet written by Sir Walter Raleigh dealing with questions of shipping and trade generally, in which he points out many anomalies in trade methods as practised by his countrymen, and draws a very unfavourable picture of the English ship as compared with her Dutch rival. This was written at the beginning of the seventeenth century. A Dutch ship could be so easily handled that she required a crew of but one-third the number necessary in an English built ship of the same size. This advantage had done much toward giving the commercial supremacy to the Dutch, so that Holland had become the great distributing centre of Europe, whereas "the situation of England lieth far better for a storehouse to serve the South West and North East Kingdoms than theirs do, and we have the far better means to do it if we apply ourselves to do it. . . . We send into the East Kingdoms yearly 100 ships, and our trade chiefly depends on Elbing, Königsberg, and Dantzig . . . the shipowners of the Low Country send thither about 3000 ships, trading with every city and port and town, making their purchases at better rates than we do. . . . The Hollanders send into France, Spain, Portugal and Italy from the East Kingdoms, passing through the Sound yearly, with Baltic produce, about 2000 merchant ships, and we have none in that course. They traffic with every city and port round about this land with five or six hundred ships a year, and we chiefly to three towns in their country; the Dutch trade to every port and town in France, and we only to five or six!!" Finally he laments that although in the whole of Holland there is scarcely a tree to be seen, yet by their energy and determination these Hollanders build a thousand ships each year.

During the seventeenth century two things were to alter this state of affairs—the application of science to shipbuilding, and the active measures taken by Cromwell to improve English shipping. The first of these is connected with the name of Pett; the second raises a question to be dealt with later—the Navigation Laws.

For nearly three-quarters of a century stories about the wealth of the Indies and the abnormally profitable trade in the Far East had been in the mouths of the traders of Europe, but this trade remained for long in the hands of the Portuguese, who had been the first to double the Cape of Good Hope and sail across the Indian Ocean. The Dutch had followed the example of the Portuguese, with the result that Amsterdam at first rivalled, and then outstripped, Lisbon as an emporium and distributing centre. English sailors, too, had become increasingly venturesome. Their discoveries and voyages could rank with any accomplished by Spaniard or Portuguese, but the coasts of Newfoundland and North America at the outset offered but scanty profits to trading ventures. Thus Englishmen began to turn their eyes to the Far Eastern lands whose resources and wealth were seemingly limitless.

In the year 1587 Sir Francis Drake had been scouting round the Spanish ports picking up information about the great preparations that were being made for the invasion of England. He had boldly sailed into Cadiz harbour, and between the 19th of April and the 1st of May he had burnt up the shipping after taking possession of anything likely to be useful. He had "singed the King of Spain's beard," as he quaintly put it. Nor was this the whole extent of the adventure, for although his Vice-Admiral had refused to follow him into Cadiz, and after the exploit had had to be sent home to prevent trouble, Drake knew that in the Tagus lay the pride of the Spanish navy, some fifty warships, the largest then afloat. If he could destroy these, the threatened invasion would be severely crippled, if not prevented altogether. However, feasible as was the project, Elizabeth, hoping that peace might yet be arranged with Philip, forbade the attempt. But before returning to Plymouth, Drake determined to cover the cost of this expedition, if possible, at Philip's expense. To this end the English squadron sailed for the Azores, and captured a richly laden ship, the *San Philip*. So rich was this prize that "every man in the fleet counted his fortune made." The importance of this capture can hardly be overestimated. In passing it should "be noted that the taking of this Carack wrought two extraordinary effects in England: first that it taught others, that Caracks were no such bugs but that they might be taken . . . and secondly, in acquainting the English nation more generally with the particularities of the exceeding riches and wealth of the East Indies: whereby themselves and their neighbours of Holland have been encouraged, being men as skilful in Navigation and of no less courage than the Portugals to share with them in the East Indies: where their strength is nothing so great as heretofore hath been supposed."[1]

The *San Philip* was returning from the East Indies, and among the papers found on board were records of trading which opened the eyes of English merchants to the possibilities of this new trade. What had been rumours, possibly exaggerated, and at any rate uncertain, before, were now substantial facts. There was ample evidence to show that enormous profits were to be made by voyaging to India. Nor is it to be wondered at that this was the starting point of fresh trading developments, and led to the founding of the East India Company; one of the most interesting trading institutions ever organised, and destined to have considerable influence, both good and bad, on British shipping progress.

Within two years of this capture, Elizabeth received a petition begging her to grant a licence to trade with the Indies, and though she stayed her hand for a few years, not feeling sure as to the effects such action might have on foreign politics, in the year 1599 she gave a charter to the Earl

[1] Hakluyt's *Voyages*, iv. p. 285.

of Cumberland and about two hundred knights and merchants, granting them for fifteen years certain trading privileges with India. Thus was founded the celebrated East India Company.

English merchants had not waited for a licence; acting on their own initiative, in the year 1591 two small squadrons of three ships were fitted out at Plymouth: the first sailing in April, and the second in August. This latter was fated to be the last voyage of Captain Thomas Cavendish or Candish, a remarkable seaman who, five years before, had circumnavigated the Globe in eight months' less time than Drake had taken. He was the first to recognise the value of St Helena as a port of call for ships. Cavendish can only have been a very young man at the time of his death, as on his first voyage he is said to have been but twenty-two years old. Hakluyt tells us: "The 28th of August 1591 we departed from Plymouth with three tall ships and two barkes, *the Galion*, whereon Mr Cavendish went himself, being Admiral, The *Roebucke*, the Admiral whereof Mr Cocke was Captaine, The *Desire*, Rere-Admirall whereof was Captaine M. John Davis, . . . *The Black*, pinnesse, and a barke of M. Adrian Gilbert whereof M. Randolfe Cotton was Captaine."[1]

This voyage, though unsuccessful in itself, and entailing great misery on all concerned, added immensely to the knowledge of the conditions and possibilities of the East Indian trade. The

[1] *Voyages*, viii. p. 289.

great lesson learned was the necessity for the establishment of factories, and the developing of a regular trade on a large scale.

The other expedition consisted of "three tall ships"—one of which, the *Edward Bonaventura*, had fought the Armada three years before, and was the only one of the fleet destined to reach India. She was commanded by James Lancaster, who concludes the narrative of his adventurous voyage—"We took passage for Rye and landed there on friday the 24th May 1594, having spent in this voyage three years, six weeks and two days, which the Portugales perform in half the time, chiefly because we lost our fit time and season to set forth in the beginning of our voyage. We understood in the East Indies, by certain Portugales which we took, that they had lately discovered the coast of China to the latitude of nine and fifty degrees, finding the sea still open to the Northward, giving great hope of the Northeast or the Northwest passage. Witnesse Master James Lancaster."[1]

One cannot admire sufficiently the courage and strength of purpose which inspired the early navigators to go through perils, the like of which we can scarcely conceive; and then be ready to sail again, feeling that each voyage marked another advance, and so was well worth all the hardship and toil.

Within a few months of the signing of the East India Company's charter, Lancaster was ready to lead another expedition to the East. His largest

[1] *Voyages*, iv. p. 259.

ship was the *Dragon* of 600 tons, carrying a crew of 202 hands; the accompanying ships were the *Hector*, 300 tons, two small ships of 200 tons each, and a store ship, the *Guest*, of 130 tons.

Under the Charter many privileges were conceded to the Company. Goods exported were not liable to duty for the first four voyages, and import duties were relaxed in their favour. Concessions too, were made enabling the Company to export a certain amount of bullion. Six ships and six pinnaces, with a complement of 500 men, might sail annually. The capital of the Corporation was fixed at £72,000. This was speedily subscribed, and the five ships already mentioned, with a crew numbering 480 hands all told, were soon in commission. The ships and their equipment cost the Company £45,000; and their cargoes cost £27,000; thus the whole of the authorised capital was employed in this one venture.

All went well, and the expedition returned to England with rich cargoes, after having established friendly relations with the ruler of Achin, and founded a factory at Bantam.

At first it was the Portuguese who disputed the English a footing in the Indies, but quite shortly after the formation of the East India Company, the Dutch India Company was founded, and a rivalry commenced which culminated in the days of Cromwell with the passing of the Navigation Act. English merchants, after a few years' experience of the new trade, were little inclined to leave India to the Dutch.

It is on record that one ship, *The Globe*, belonging to the English Company, made 218 per cent. in five years; three others, the *Hector*, the *Thomas* and the *Clove*, after a three years' cruise, were found to have made even greater profits; whilst another ship on a voyage of twenty months left a surplus of nearly 350 per cent.

This is not the place to write a history of this great trading Company. As is well known it became increasingly wealthy and its ships increased in tonnage and in numbers; but being safe-guarded by a charter, and enjoying a monopoly of a very wealthy trade, their methods became stereotyped and inelastic. Ships were built without regard to cost, and were little suited for any other trade. Hence it is not to the ships of the East India Company—fine though they undoubtedly were—that we must look for developments. As the eighteenth century shaded off into the nineteenth, one must turn to the West Indies for improvements both in design and sailing qualities. In connection with the *Free Trader* of the West Indies, a much less showy ship, but subject to a competition growing keener as the years passed by, a steady advance in naval architecture can be remarked. Though a much smaller vessel than the ships of the Company, she evolved new methods in equipment, and new economies in ship management, which were to be of the greatest service, when during the nineteenth century the world trade was, for all practical purposes, thrown open to all comers on fairly equal terms. It may, however, be suggested that the East Indiaman was the embryo of the modern liner; the Free Trader as the stock whence sprang that exceedingly useful ship in opening up new trades, the modern cargo tramp. When the East India trade was eventually thrown open, it was small ships of from 500 to 800 tons that, in the first instance, began opening up new markets, both there and in the Pacific.

CHAPTER III

WOODEN AND COMPOSITE CLIPPER SHIPS

During the last half of the eighteenth century British shipping had increased enormously both in tonnage and in importance. The East Indiaman was undoubtedly a splendid ship, but economy of management, the possibility of greater carrying capacity, and the adoption of labour saving devices to lessen the number of the crew, were apparently questions to which the Directors gave but slight attention. Their ships were built and managed on a system very similar to that of the Royal Navy, indeed no expense was spared to get the best results. Whilst a ship could be built by an ordinary owner at about £25 a ton, those built for the Company cost as much as £40, or even more. Moreover these ships were effectively armed, and their crews occupied the 'tween decks, man-o'-war fashion, thus considerably reducing cargo carrying capacity.

The nineteenth century opened full of gloom for trade. Europe was not to see the last of the Napoleonic troubles for another fifteen years. Still some good came out of the evil, for when the war terminated, trading possibilities were very considerably augmented. And with greater trade, the type of ship improved. The greatest improvements, and, indeed, the final types of sailing ships were produced through British and American competition and emulation.

But before dealing more in detail with this, a few more words may be said about the ships engaged in the West Indian trade. This trade centred in London, Bristol and Liverpool. The ships employed were comparatively small, but very capable; they could be run with a minimum of crew, and their carrying capacity was extraordinarily good if compared with the more aristocratic vessel employed in the East Indian trade. The capacity of the West Indiamen for carrying cargo was considerably in excess of their registered tonnage, and there was a saving of nearly 50 per cent. in the crew required. As a sea-boat these ships were quite on a par with the larger and more expensive vessels, nor were they at all inferior in speed. The type of ship thus evolved was capable of going to any port where freight could be picked up, and was a very handy, useful vessel, just what was needed at the time for cargo carrying purposes.

The great fault of these ships was that the beam was excessive as compared with the length; the ordinary rule being that the length should measure about four times the beam, thus speed was sacrificed to what was considered to give safety. These unsuitable dimensions continued to be the rule in British shipbuilding until the success of the

American clippers compelled British shipowners and builders to fundamentally reconsider the question of ship design. The first American clippers were the small but remarkably fast-sailing Baltimore brigs, which were succeeded by fully rigged ships of large tonnage built at Boston and New York.

The great advance in British shipbuilding, however, came after the repeal of the Navigation Laws; indeed the really interesting period of the British sailing ship lies between the years 1850 and 1890, and the sailing ship may be said to have been at its best at the moment when the great economies, and the greater regularity connected with steam, had pronounced the doom of the more picturesque, and, perhaps, one may say, the more lovable, type of ship.

During the first half of the nineteenth century there was the keenest rivalry between the United Kingdom and the United States for the ocean carrying trade of the world. Statistics show that at one time there was every probability that America might gain the supremacy. When the continental war ended in 1815, the tonnage of the mercantile marine of the United Kingdom was, in round figures, double that of the United States; and this, at a time too, when shortage of food production in Europe, owing to the cultivators of the land having been employed for fighting purposes, had created an artificial demand for imports of food from America, a trade that had considerably stimulated American shipping. The American shipping community were warned by clear-sighted observers that their industry would suffer a setback; but such was the development of trade after the political strife was over, that new markets and new routes were available for the employment of ships which had been constructed for the trade with Europe. Thus American foreign tonnage, after fluctuating for rather more than a decade, began about the year 1830, to go steadily ahead, until by the year 1850 the total tonnage of the Republic, including lake and river craft, was only about three-quarters of a million tons below that of England; and by the year 1861 the margin was reduced to about a quarter of a million tons. Then the tide began to flow in favour of the British shipowner, the change being mainly due to three things. First of all, after the Civil War, Americans apparently decided to concentrate their efforts on the internal development of their own country; then British shipbuilders produced a new type of ship, faster and better built, and so giving both better despatch and sounder delivery of cargo than the American clipper; and lastly the substitution of iron for wood by British builders as the material for ship construction, and the all-round success of the iron ship, at a time when America was not a great producer of iron and steel. A fourth cause might be advanced, namely, the repeal of the Navigation Laws in 1849. Some British shipowners looked on this as "the last straw"—but the possibility of being driven off the sea, or perhaps it may be the stimulus given by the loss of protection, brought out the best fighting qualities of the British owner. Then later, Richard Green and W. S. Lindsay set an example which was readily followed with the happiest consequences. The story of this half century of keen competition is of absorbing interest, a few of the main facts may well be mentioned here, even at the risk of some repetition.

On the 26th June 1849 the Royal assent was given to the repeal of the greater part of that shipping legislation known as the Navigation Laws. Four years later the last remnants of this policy disappeared from the Statute Book, the coasting trade being thrown open to all comers. The Americans to a certain extent followed the lead of England. In October 1849 the United States Government threw open the foreign trade of the Union, but retained what is euphemistically called the coasting trade of the country in its integrity for the benefit of American bottoms. The American coasting trade is made to include voyages from the Atlantic to the Pacific ports and vice versa, although such voyages entail rounding Cape Horn and passing foreign coasts. This reservation has recently, with the prospect of the opening of the Panama Canal, become of even greater moment and notoriety.

When the rivalry between Great Britain and the United States commenced, the British trading ship was of the type which had developed in the West Indian trade. To modern ideas she was very small, only measuring from 350 to 700 tons. In appearance these ships were bluff-bowed, and heavy in the stern. They were good cargo carriers, easily lifting fifty per cent. more than their nominal tonnage. But the American was determined to have the supremacy on the sea if possible. The British ship being built of hard wood was strong and sea-worthy, the American builder had at his disposal vast quantities of soft wood. He could build a cheaper, if weaker ship, and with characteristic progressiveness he turned his attention to improving the sailing qualities of the craft he constructed. Hence the length of the ship was developed to five or even six times that of the beam, and the bluff-bow and heavy stern gave place to the more pleasing and graceful lines of the clipper. It was soon found that these ships had remarkable sailing qualities, but their strength was not sufficient to stand the strain of long voyages. Cheapness and speed were on the side of the American—strength, and probably safety, the only advantages that the British owner could claim. Naturally the American in many trades obtained the preference to the detriment of British shipping, which indeed began to feel the competition very keenly.

For a time there was considerable despondency in British shipping circles, and the Americans were correspondingly elated, but this state of affairs was not to last long. Mr T. H. Farrer (afterwards Lord Farrer) has put on record a speech made by the most prominent London shipowner of the day, Mr Richard Green, at a dinner held on behalf of one of the Marine Charities in London in the year 1850.

The Secretary of the American Legation was present and made a speech in which he referred to the developments in the shipping of the United States and their possible effects. Mr Green, who spoke next, confessed his ignorance of American conditions, and then uttered sentiments which were echoed by every British owner present—nor were they only echoed, for the policy outlived by the speaker was accepted and acted upon.

"This I do know," said Mr Green, "that we, the British shipowners, have at last sat down to play a fair and open game with the Americans and . . . we will trump them." Mr Green's trump card was the building at Blackwall Yard of the *Challenger*, a ship which developed extraordinary sailing qualities, not only did she outclass the American ships in this respect, but being of stronger build, there was another and even more important advantage, namely that her cargoes were landed in sound condition, which was not usual with the cheaper soft wood ships. In the year 1856 a ship called the *Lord of the Isles*, built by Scott of Greenock, beat two of the fastest American clippers in a race from China to London. These events may be said to mark the return of supremacy to Great Britain. With the advent of a ship having equal or even slightly better sailing qualities and capable of carrying cargo without damaging it, the English owner regained his old supremacy; thus after the American Civil War, shipping competition between the two countries came to an end. The rivalry was thenceforward to be between British builders, owners, and captains, who vied with each other in attempting to build, own, and handle the fastest ship afloat. On the Thames, on the Clyde, and at Aberdeen, clippers were designed and built which were for about the next twenty years a source of absorbing interest alike to the commercial and the sporting world. A hundred days' race from China to London with the new season's teas was a great event, when the contests included such ships as the *Lahloo*, *Taitsing*, *Thermopylæ* and *Cutty Sark*, compared with which American Cup challenges are very minor affairs.

It was thought that these clippers would continue to hold a monopoly of the tea trade even when steamers were built that could with economic advantage undertake long voyages. For it was supposed that steamers must taint the flavour of the tea. In the year 1863, however, a steamer, the *Robert Lowe*, measuring 1250 tons, loaded tea from Hankow, and delivered her cargo in good condition in London. This proved the possibility of transporting tea by steamer. And although the clippers held their own in the tea trade for another eight or ten years, and some of the finest of them were built after the successful voyage of the *Robert Lowe*, eventually they had to be taken off this route. They were then employed principally in the Australian trade, in which most of them ended their days so far as the British flag is concerned, the last of them disappearing about the end of the century. When sold by their original owners, several of these fine ships continued doing good work under foreign flags. The *Thermopylæ* lay in the Tagus as a training ship, until a few months ago, when she was taken out to sea and sunk; the *Cutty Sark*, renamed the *Fereira*, and under the Portuguese flag, was (1914) still afloat. But the great days of sailing ships racing from either China or Australia are over.

With the improvement in design came improvements also in construction. In the early days of the nineteenth century the possibility of building a craft of iron that would float was tested, but for long the experiment was not fully developed. There was a prejudice against building a ship of a material which could not float, it being considered contrary to nature to expect an iron ship to be successful. It was, however, grasped that there would be a gain in lightness and capacity, and this led to the introduction of what is known as the composite built ship. The wooden beams and framing of a ship were not only of great weight, but reduced carrying capacity, and limited the dimensions to which a ship could be built. In the year 1839 a Mr Watson of Dublin conceived the idea of substituting iron for wood in the framing of a ship, and twenty years later the first composite built ship, the *Tubal Cain*, of 787 tons, was built at Liverpool. A large number of very fine ships were built on this plan during the next thirty years. The fastest of the tea clippers were iron framed, planked with teak wood, and fastened with Muntz's metal bolts. There were both advantages and disadvantages in this method of construction. It was discovered that the natural oil in teak wood is a good preservative of iron, and indeed that teak is the only wood that can be brought into contact with iron for shipbuilding purposes without either suffering injury itself or injuring the iron. Hence even at the present time when vessels are no longer constructed on the composite principle, where wood and iron come in contact, in positions exposed to the weather, the wood used by shipbuilders is teak. Teak decks are for ordinary ships a luxury, but even where the decks are of soft wood, teak is used round hatch coamings, and is fitted adjacent to the iron waterways. On the other hand experience proved that the fastening of wood planking on to iron framing by metal bolts, bringing about a contact between metal and iron, causes the latter to corrode away far too quickly. These composite ships, however, did excellent service in their time, and there were among them some remarkably fine specimens of naval architecture.

When the iron frame came into fairly general use in ship construction, and it was realised that iron plating riveted with iron rivets would remove the trouble caused by the contact of copper and iron (whilst there would be a further saving in weight), it was only a question of overcoming prejudice, before the ship constructed entirely of iron would become the standard.

CHAPTER IV

THE IRON SHIP

The invention of the rolling mill revolutionised and very considerably increased the utility of iron. Nowadays iron and steel in every conceivable form and shape, from the plate of great width and length to the angle, are among the common objects of life. Before the invention of the rolling mill such shapes were practically unobtainable. It was owing to this that the early engineers had to use either cast iron or copper for the construction of their boilers; and cast iron boilers, as sad experience proved, are very apt to burst and cause damage. But with the possibility of rolling plates, angles, and many other convenient forms of iron, new spheres of utility were opened up. Prior to that the iron on leaving the furnace could only be fashioned by heating and hammering. To have constructed a small ship out of hammered plate would have presented many difficulties, in addition to that of cost; to have constructed an *Aquitania* would have been an impossibility. Great indeed is the world's debt to Henry Cort the inventor. His puddling process has been eclipsed by the subsequent inventions of Bessemer and Thomas, but it was he who, having produced a ball of puddled iron, invented a method by means of which the ball could be rolled by a mill into practically any shape, thus making iron for structural purposes of all kinds a substitute, not only for other metals, but for timber, brick and stone. Well earned indeed was the pension of £200 a year conferred on him by the English Government, for had not the rolling mill been invented many of the greatest engineering and architectural feats both ashore and afloat of recent years could never have been attempted.

It was during the last twenty years of the eighteenth century that Henry Cort perfected his processes. The first use of rolled plates appears to have been for boiler construction about the year 1786. The following year John Wilkinson constructed the first iron boat. This, the first application of iron to shipbuilding, was a canal barge about seventy feet long. The plating was over a quarter of an inch thick and the riveting was round-headed, so that every rivet head showed on the outside. Countersinking had yet to be invented. This barge was rightly named the *Trial*. Although the framing and plating were of iron, the beams, and the stem and stern ports were of wood. Her total weight was eight tons, and she could lift a cargo of twenty-three tons of iron. Little could Wilkinson have foreseen the outcome of this initial experiment in iron shipbuilding. Still less probably did Cort realise what must be the outcome of his rolling mill.

It was not until the year 1817 that the first iron craft was built on the Clyde. This was the *Vulcan*, built by Thomas Wilson at Faskine for the Forth and Clyde Canal Company. She was 61 feet long, and the framing was of flat bar iron. These bars and the stanchions required for the work were all forged by hand. In the year 1819 this boat began to ply on the Canal, and the durability and the reliability of iron for ship construction was proved by her long service of nearly seventy years, during which time she did hard work, carrying coal and other heavy commodities.

Timber suitable for shipbuilding was becoming scarce. Soft wood was not satisfactory for the construction of ships to be employed in first-class trading; English oak could not be procured in anything like the quantity required for a rapidly developing commerce, nor was it an economic material for ship construction. There was for some time a prejudice against the use of iron, and it must be admitted that there was some excuse for this prejudice, for it was believed that the influence of iron on the compass would render the navigation of an iron ship very difficult, if not impossible. To strengthen this belief, one of the first iron ships, the *Tayleur*, bound from Liverpool to Melbourne, was wrecked on Lambay Island, near Dublin, during a fog on January 19th, 1854, with the loss of 334 lives. This disaster was attributed to a deviation of the compass owing to magnetic attraction. Teak came into general use, both for mercantile and naval ships. But it became evident, that with the growing possibilities of world trading, iron must be the material of the future. It was private enterprise that proved the practicability of the new material. Even when iron steamers were an assured success, the Post Office refused to allow letters to be carried by them; nor did the Navy build the first iron battleship until the year 1860. And yet when once tried and proved by experience to be a success, iron offered so many advantages over wood, that one might wonder at the long time required for the prejudice in favour of wood to die out.

In practice it was proved that in spite of the greater specific gravity of iron, an iron ship was of considerably less total weight than a wooden craft of similar dimensions. In a typical wooden ship the weight of hull and equipment was about forty per cent. of the total displacement, whereas in an iron ship it averaged about thirty per cent., and this in spite of the fact that the first iron ships contained much more metal (thicker plates and heavier framing) than later experience showed was necessary. Moreover an iron ship being in actual weight about one-quarter less than a wooden ship of the same tonnage, there was a corresponding addition to cargo carrying capacity, which meant greater earning power. Added to these advantages was strength, and the possibility of almost indefinitely increasing the dimensions of a ship. To the building of a wooden ship a length of about

300 feet was the structural limit, nor when steam was introduced could a wooden hull be constructed of sufficient strength to stand the vibration caused by the screw propeller. Long before the 'sixties of last century, the greater possibilities connected with iron had been conclusively proved; and in 1858 the *Great Eastern*, with a length of nearly 700 feet, proved to the world at large that a great length, a vast tonnage, and a capacity entirely out of the question if wood was adhered to, could with absolute safety be relied on with iron as the material for construction. The great firm of Lairds' of Birkenhead made their name mainly through constructing ships of the new material. After building various small crafts with success, they built in the year 1834 a somewhat more ambitious vessel in the shape of the *Garry Owen*, a ship measuring 125 feet long and 21 feet 6 inches beam. During her first voyage this ship was driven ashore during a heavy gale, nor was she the sole victim, but other craft built of wood were completely wrecked. The *Garry Owen* was refloated and found to be uninjured. This experience was an added argument for the substitution of iron for wood in shipbuilding, and was considerably strengthened about thirteen years later when Brunel's famous steamer, the *Great Britain*, a very much larger vessel than the *Garry Owen*, stranded on the Irish coast in Dundrum Bay. From the first, both designer and owners had been satisfied with this, the largest iron ship as yet constructed. Her

dimensions were—length 322 feet, beam 51 feet, depth 32 feet 6 inches, measuring 3270 tons. Although she stranded on a rocky coast, and her bottom was holed amidships, she withstood the fury of the gale in the Irish Sea all through the winter, and finally, thanks to Captain Claxton and Mr Brunel, she was, after great labour, lightened and towed safely into Belfast, and found to be practically uninjured; and was entirely unstrained, although she had been ashore about eleven months.

During this time, steam, as we are about to see, had been applied with success to ocean-going craft, but for another half century the sailing ship was to hold her own in certain trades, and in doing so many improvements both in design and in equipment were introduced. The large four-masted sailing ship of the end of the nineteenth century was, perhaps it may even still be said is, a craft of great economic power. Her carrying capacity has been increased to the utmost, and by various devices the labour required to work such a ship has been reduced to a minimum. Still the great defect remains that as compared with a steamer, a sailing ship is irregular and uncertain. Fast sailing ships like *The Tweed* and the *Thermopylæ* sometimes made the voyage from London to Australia in a little over sixty days, which meant that everything went well and that fair winds prevailed; but sometimes the same ships on the same voyage would make a passage of nearly one hundred days. In a word there was uncertainty because the motive power was uncertain. In the case of a steamer this element (barring accidents) is eliminated, and thus the great Mail Steamship Lines are able to publish time-tables almost as accurate as those issued by the Railway Companies. Where regularity and saving of time are no object the sailing ship had the advantage, and for long was able to compete because she could be run at less expense, but those days would appear to have well nigh passed away—the day of sailing ships in all trades is practically over. Ship owners, however, made a stubborn fight for *sails*. In France the big sailing ship is still a favourite, the Germans too own some very fine ships of large tonnage, whilst the Americans operate large craft rigged as fore and aft schooners, some of them having six or even seven masts and of quite a large tonnage.

Not only by improvements in design, and by cutting down working expenses did sailing shipowners attempt to hold their own against steam, but in order to obtain regularity and punctuality, as these were jeopardised by light winds and calms, a series of attempts extending over many years were made with the object of fitting sailing ships with some method of auxiliary power which might be utilised when the wind failed. The small ships of olden days had been equipped with "sweeps"—large oars—and with these the crew attempted to make headway when becalmed. Pirates and smugglers had frequently escaped capture by getting out their own sweeps when the wind failed and the man-o'-war was on the point of making a capture.

Large cargo ships were fitted with an auxiliary engine driving a propeller that could be hoisted clear of the water when not in use. The early steamers themselves were really auxiliaries, for they carried a very considerable spread of canvas; nor was it till about ten years ago that the spars and canvas of a steamer were reduced to a minimum.

The causes of failure of these auxiliary sailing ships were that either the engine power was satisfactory, in which case a great amount of space was required for engines and boilers, and the engine department required a considerable staff; which, when not required, was an economic loss, or when engine power was reduced, and so space and staff were economised, the propelling power was not adequate for any useful purpose.

There is now (1913) a recrudesence of the auxiliary principle. It is thought that the internal combustion engine may be utilised to enable the sailing ship to hold her own in certain trades. The engine and fuel require but little space, and the staff necessary to work the engine is small, one skilled engineer being sufficient to keep the machinery in order and attend to emergencies, for unskilled men can attend to the engine under ordinary circumstances. It is suggested that large sailing ships with Diesel auxiliary engines may be able to compete with steamers for the trade of the west coast of South America, and even use the Panama Canal route when available. There are already some ships afloat fitted in this way. One of these is the *Sound of Jura*, a ship of two thousand tons register, having four masts, schooner rigged with square sails on the foremast. She is owned in South Shields by the Southern Whaling and Sealing Company. The French have already at least two of these ships —the *Quevilly* and *La France*, both owned by Monsieur Preuthout, Lebland and Co., of Havre. *La France* is the largest sailing ship afloat, measuring 10,730 tons, and having in addition to her auxiliary engine a sail area of 7800 square yards. She was launched from the yard of the Chantier de la Gironde at Bordeaux in February 1912, is fitted with two Schneider-Diesel engines of 900 B.H.P. each, capable of driving her at a speed of ten knots. She is at present employed in the ore trade with the New Caledonia. Is there likely to be a future for such vessels ? This is not an easy question to answer, at least during the infancy of the internal combustion engine; but it should be remembered that if this type of engine can be economically employed in a sailing ship of 10,000 tons, as a partial motive power, it will also be utilisable in a similar craft without sails as the sole motive power. The increased space required for a more powerful set of engines will not be the equivalent of the cost of the still comparatively large crew required for manœuvring a sailing ship, and there will be practically no expenses for masts, rigging and sails, which with a spread of 7800 square yards of canvas is a considerable item. It would appear, therefore, that the present attempt to contrive some auxiliary power to assist the sailing ship is likely to have no greater success than those of the past; and at best can but postpone the final disappearance of the sailing ship for a few years.

CHAPTER V

THE INTRODUCTION AND DEVELOPMENT OF STEAM

Both the United Kingdom and the United States of America lay claim to having been the first to successfully apply steam power to navigation. The truth is that honours should be divided between the two. There can be no doubt as to the fact that the first successful steamer capable of doing service either in the carriage of passengers or goods was the *Charlotte Dundas*, which was built on the Forth and Clyde Canal by William Symington for Lord Dundas, and made her trials on the Canal in the early part of the year 1802. This craft was fitted with an engine, constructed by Watt, which drove a stern wheel. Fourteen years prior to this Miller and Symington had tried a successful experiment on Dalswinton Loch, and a few months later these same two had run a little steamer on the Forth and Clyde Canal. In the year 1797 Livingstone in America failed to apply steam power successfully to water-borne craft. Nor was he more successful some six years later when he tried further experiments with steam power on the river Seine, assisted by Robert Fulton. All these early attempts, successful and unsuccessful, had no immediate practical result, but after a few years the *Charlotte Dundas*, as has been mentioned, was a success, and was able to perform definite service; not only so, but she was the direct inspiration to both Bell in Scotland and Fulton in America. Both these pioneers examined her; Bell produced the first successful passenger steamer in Europe—this was the *Comet*, built in the year 1812—and Robert Fulton obtained the information from William Symington which enabled him to successfully construct and engine the *Clermont*. Fulton built the *Clermont* in the yard of Charles Brown at New York in August 1807. She was 133 feet long, and was engined by Boulton and Watt. In the autumn of the year 1807, this remarkable vessel made her first trip to Albany, steaming a distance of 130 miles in thirty-two hours, and making the return journey in two hours less. After this she ran regularly, and was thus the first steam vessel to maintain a continuous long-distance service. Thus whilst it was in Great Britain that the first successful application of steam to navigation was made, America must have the credit for making the first considerable use of the new possibility, for Fulton's *Clermont* was running regularly between New York and Albany five years before Bell's *Comet* commenced running the first regular passenger service in Europe.

The Clyde, the birthplace of this marine engine, became the great centre for the construction of steamers. Denny, of Dumbarton, in 1814 built the *Marjory*, the first steamer to run regularly on the

Thames. During the previous year four steamers were built on the Clyde, in 1816 this number was doubled, and by 1822 no less than forty-eight steam craft were constructed on this one river.

On the other side of the Atlantic the marine engine was taken up much more energetically, and it is recorded that within fifteen years of Fulton's success with the *Clermont*, no less than three hundred steamers were employed on the American river and lake services.

Meantime two very important developments in connection with steam propulsion took place. John Stevens in America made a successful experiment with the screw propeller—this was in the year 1804—and in the year 1820, at the Horsley Iron Works at Tipton in Staffordshire, Mr Aaron Manby designed and constructed the first iron steamer. This vessel was 120 feet long, and had engines of 80 H.P. Originally constructed in the Midlands, she was brought in sections to the Thames, and reconstructed in the Surrey Commercial Docks. Then with a cargo she crossed over to Havre, and steamed up the Seine as far as Paris, her arrival there arousing considerable interest. Mr Manby afterwards opened engine works at Charenton on the Marne, near Paris, where more iron steamers were constructed. And it was one of Mr Manby's iron steamers, constructed at Tipton, that commenced steam service in Ireland—this was on the river Shannon in the year 1825; this craft continued to run well into the 'fifties, proving that Manby could build not only a successful, but a durable, vessel.

On the Clyde it was some years yet before a marine engine was fitted to an iron hull. The first iron steamer was the *Aglaia*, a small craft of thirty tons, built in the year 1832. It was ten years later, in the year 1842, that the first iron steamer was constructed on the river Tyne. This was a boat of 155 feet long, named the *Prince Albert*.

With all these comparatively small craft plying on European and American waters, it was not long before the possibility of ocean voyages under steam power was mooted. There were many difficulties to overcome, however, before anything like a run under steam across the Atlantic could be successfully accomplished. The first marine engines were cumbersome machines, and the boilers consumed extravagant quantities of fuel. All the successful craft were propelled by paddles, and many experiments would be necessary before attempting a long voyage. There is considerable interest now in tracing out the development of the marine engine: how the skill of man has surmounted obstacle after obstacle, producing in turn the screw propeller, then the compound engine, to be improved by triple and quadruple expansion; and, finally, the turbine has come, which in its geared form is probably the last word in steam. Such a series of improvements augurs well for the internal combustion engine. At the moment of writing, as will be seen later, the interest of the shipping community is fixed on the competition between the internal combustion engine and the geared turbine; nor is it possible yet to foretell which in the end will prove itself to be the more satisfactory and economical.

It would not be correct to connect the successful marine engine and the steamer with any one river, but it cannot be denied that since James Watt succeeded in producing a model steam engine at Glasgow in the year 1766, then on through the experiments of Miller and Symington, Bell, Denny and Elder, there is a sequence of improvement in engine and ship through which one can trace out the evolution of the steam-propelled vessel from the *Comet* to the *Aquitania* on the Clyde with a completeness that would not be possible elsewhere. The Thames, the Tyne, and Belfast have all produced fine ships, but the Clyde alone can tell the story of gradual perfection of the steamer, with illustrations taken from the shipyards on its own banks.[1]

It is worthy of note, too, that this perfection from first to last has been almost entirely due to private enterprise and energy. From the moment when Henry Bell conceived the idea to which he so successfully gave concrete form in the *Comet*, down through the introduction of compound and triple expansion engines, turbines, and even internal combustion engines. Governments both at home and abroad have for the most part been content to wait and see; at times even snubbing the inventor who has had the temerity to offer for consideration the particulars of any new ideas.

As early as the year 1800 Bell approached the British Government on the subject of steam navigation; the Admiralty, however, not only did not encourage him, but administered such a rebuff that, feeling the position hopeless in England, about three years later he made known his theories to the various governments on the Continent and to the United States. So far as is known the only result of this action was that the United States Government sent Bell's communication to Fulton, and Mr Lindsay in his *History of Merchant Shipping* tells how there was correspondence between Fulton and Bell, which led the latter to write some years after: "This letter (from Fulton) led me to think of the absurdity of writing my opinion to other countries, and not putting it into practice in my own country: and from these considerations I was roused to set on foot a steam boat, for which I made a number of different models before I was satisfied. When I was convinced they would answer the end, I contracted with Messrs John Wood and Co., shipbuilders, of Port Glasgow, to build me a steam vessel according to my plans: 40 feet keel, and 10 feet 6 inches beam, which I fitted up with an engine and paddles, and called her the *Comet*, because she was built and finished the year that a comet appeared in the north-west part of Scotland."

The same reluctance on the part of Government to take a leading part in a new departure is seen when iron was introduced as a substitute for wood in shipbuilding. Indeed, the Chief Constructor of one of the Royal Dockyards said to Mr Scott Russell, years after the success of iron for shipbuilding had been proved: "Don't talk to me about ships of iron, it's contrary to nature."

However, both in the use of iron for shipbuilding, and in experimenting with, and gradually extending the area for the utilisation of the marine engine, private enterprise continued its work, and with each successful experiment the length of voyage that could be usefully and economically performed by steam was increased.

Before the end of the eighteenth century, at the time when small river craft were beginning to run fairly satisfactorily under steam power, Mr Fitch of Connecticut ventured to prophesy that sailing ships would *soon* be run off the Atlantic, and that the service would be performed under steam. This prophesy was fulfilled in time, but it was not *soon*. Not until 1819 was there an attempt made to cross the Atlantic, even with auxiliary steam. In that year, however, a ship, the hull and engines of which were entirely of American construction, did cross the Atlantic, and afterwards made a Northern European tour, arousing considerable interest with her performances. This remarkable vessel was named the *Savannah:* according to some accounts she was 300 tons, others say 350 tons, burden, rigged fully as a ship, and with an ingeniously contrived set of paddles amidships, which could be shut up like a fan and lifted inboard in a few minutes.

Her builder was Francis Fickett of New York. The auxiliary engine, of which the cylinder was 40 inches diameter and 5 feet stroke, was constructed in New Jersey by Stephen Vail. After several trials on the American coast, the owners determined on making a much more adventurous trial of her powers, and on May 22nd, 1819, she commenced a voyage to Liverpool. It was not until two days later that she finally left the American coast, and on June 17th she was off the coast of Ireland. Here she was chased all one day by a Government cutter, it being imagined that she was on fire! On Sunday, June 20th, the *Savannah* arrived at Liverpool, having taken twenty-nine and a half days to cross the Atlantic. There have been many varying accounts of this voyage, but from the official log it appears conclusively that she was only under steam during eighty hours. Thus a vessel with auxiliary steam power built and engined in America was the first steamship to cross the Atlantic, and did so from West to East; but this cannot be called steaming across the Atlantic. It marked an epoch and showed a possibility; it did not accomplish the voyage with steam alone as the motive power.

After remaining about a month in Liverpool, the *Savannah* got up steam again, and went up the Baltic, proceeding as far as St Petersburg, touching at Elsinore and Stockholm: this trip lasted just over a month, during which time about one-third the distance covered was under steam power. It is well to remember that the *Savannah* was only fitted with an auxiliary engine, and that even during the time that she was running as an auxiliary steamer, her owners did not attempt to run her for profit-making purposes with passengers and cargo.

At this time there were one or two scientists who attempted to prove that to steam across the Atlantic was an utter impossibility. Dr Lardner told an audience that one might as well to try to steam to the moon! He afterwards explained that "he never stated that a steam voyage across the Atlantic was a physical impossibility . . . but that the long sea voyages which were contemplated could not be maintained with that regularity and certainty which are indispensable to commercial success, and any revenue which could be expected from traffic alone, and that, without a Government subsidy of a considerable amount, such lines of steamers, although they might be started, could not be permanently maintained." Dr Lardner argued from imperfect premises. He accepted 800 tons as the size of the vessel, and 200 horse-power as the power of the engine. Mr Laird wrote to the Liverpool papers demonstrating the fallacy of Dr Lardner's contention, showing even then what economies could be effected by making use of ships of considerably greater tonnage, with a horse-power greater than that necessary for the smaller craft, but nothing like so great in proportion to tonnage. Dr Lardner's pronouncement was made in December 1835, and within three years the economic possibility of a steam service across the Atlantic had been conclusively proved.

Meantime it is worthy of note that for ten years after the trial with the *Savannah*, the Atlantic trade was principally left in the hands of the American sailing packets, but the year after the *Savannah* came to Europe, the first attempt to steam across the Atlantic from East to West was made by a ship called the *Condé de Palmella*, which sailed from Liverpool to the Brazils, but beyond the bare fact, all particulars as to ship and voyage have been lost.

In the year 1827 an English built and engined ship named the *Curaçoa* of 350 tons began trading between Europe and the Dutch West Indies. In the year 1833 Canada tried an experiment with steam. A steamer named the *Royal William* was built at Quebec and engined by Boulton and Watt. Her horse-power was 180; her dimensions 176 feet long by 27 feet beam; she crossed from Nova Scotia to Portsmouth, 2500 miles in seventeen days; but as she carried a considerable spread of canvas, and, like the *Savannah*, only utilised her steam as an auxiliary power, the experiment, although interesting, was not the first crossing of the Atlantic under steam. Five years later, however, the long-hoped-for event was accomplished by four ships—the *Sirius*, *Great Western*, *Liverpool*, and the *Royal William*—in the same year; and the fact that in one instance the date of the return journey was fixed beforehand, shows that ship-owners had gained a very complete confidence in the marine engine.

The Transatlantic service, as existing to-day, really commenced in the year 1838 with the steamers *Sirius* and *Great Western*. The *Sirius* sailed from London a few days before the *Great Western* steamed out of Bristol. But although the *Sirius* was the first to sail by a few days, the voyage of the *Great Western* was the more important event. The *Sirius* had been built for trading in European waters, and was only sent across the Atlantic to take the place of another steamer, the *British Queen*, which had been advertised, but owing to trouble with the builders, was not ready for sea in time. The *Sirius* only made the one voyage to New York, after which she traded for some years between London and St Petersburg. Her dimensions were: length 208 feet, beam 25 feet, with a measurement of about 700 tons, and engines of 320 horse-power. The *Sirius* sailed on April 4th at ten o'clock in the morning, with ninety-four passengers. The *Great Western* followed three days later. This was the first steamer specially designed and built for the Atlantic trade. Her hull was of wood, designed and constructed by Patterson of Bristol, the main dimensions being: length 236 feet, 35 feet 6 inches beam, measuring 1340 tons. The engines were by Maudslay, Son and Field, of London, and were of 440 horse-power. Both ships crossed the Atlantic without accident — the *Sirius* taking seventeen days, the *Great Western* taking fifteen. On the return trip the *Sirius* sailed on May 1st, the *Great Western* seven days later, the time taken being sixteen and fourteen days respectively.

Some of the details of the voyage of the *Great Western* are still of interest. From Bristol to New York she ran 3125 knots, averaging 208 knots a day, which makes an average speed of 8⅔ knots an hour. To attain this speed she consumed about 43 tons of coal a day, or 650 tons between Bristol and New York. For the eastward trip she did rather better, averaging 5 knots a day more, or a speed of nearly 9 knots on the very greatly reduced consumption of coal of 28 tons a day, or 393 tons for the crossing; this was probably due to the westerly wind.

The other steamers to cross the Atlantic this same year (1838) were the *Royal William*, which crossed from Liverpool to New York in nineteen days, decreasing the time in the return trip to fourteen and a half days, and the *Liverpool*, built by Sir John Tobin, and named by him after his native town. This vessel left Liverpool in October, and steamed to New York in sixteen days and a half. The great interest attaching to the performances of these four pioneer Atlantic steam voyages is that they proved the practicability of steam communication over long ocean distances, and it was made evident that so far as mails and passengers were concerned, the days of the old sailing packets between Europe and America were ended.

CHAPTER VI

EARLY RIVALRIES IN THE NORTH ATLANTIC PASSENGER AND MAIL SERVICE

WITH the success of the steamers on the Atlantic, new names appear in connection with both ship-owning and ship-building, and some of these have become historic. Mr Samuel Cunard was born at Halifax, Nova Scotia, in November 1787. His father was a merchant of Philadelphia who had settled in Halifax. Early success as a ship-owner and merchant brought Cunard to England during the year that the *Sirius* and the *Great Western* inaugurated the Atlantic steam service. It is said that seven or eight years prior to this he had conceived the idea of developing a line of steamers for the carriage of passengers and mails between America and England. Mr Cunard knew the Secretary of the East India Company, and through him obtained an introduction to Mr Robert Napier of Glasgow. A visit to Glasgow brought Mr Cunard through Napier into communication with both George Burns of Glasgow and David MacIver of Liverpool. After considering Cunard's scheme for a mail service, Burns and MacIver agreed to co-operate with him in financing and organising the line, if Cunard should succeed in obtaining the contract for the carriage of mails. At that time the foreign mail service was controlled by the Admiralty; and the latter had been satisfied by the successful steam voyages during the year 1838 that greater safety and regularity in the mail service were to be expected from steamers than from sailing ships. In October 1838 tenders were advertised for the conveyance of the North American mails by steam. The Bristol Company, whose steamer, the *Great Western*, had been so conspicuously successful, had imagined that there would be but little competition, and had confidently counted on obtaining the contract. It was, therefore, an unpleasant surprise to them to find that Mr Cunard's tender was not only lower than theirs, but other terms he offered made it greatly to the interest of the Admiralty to accept his tender, which was sent in, in the names of Samuel Cunard, George Burns, and David MacIver. In complying with the terms of the contract these three ship-owners founded, in the year 1839, the British and North American Royal Mail Steam Packet Company to carry the mails between Liverpool and Halifax, Boston, and Quebec. Three steamers were required to make two voyages a month across the Atlantic. At first only the English time-table was fixed; later developments led to fixing dates for sailing from America, and the construction of a fourth steamer. The original subsidy was £55,000 per annum, this was raised to £81,000 when the developments necessitating an additional steamer came into force. The four first steamers of what ultimately became the Cunard Steamship Company were the *Acadia*, *Britannia*, *Caledonia*, and *Colombia*. Of these the *Britannia* was slightly the largest, measuring 1156 tons, as against the *Acadia*, 1136 tons, but all four were very much of a size, the *Britannia* and *Colombia* being 207 feet long, the *Acadia* and *Caledonia* 206 feet: the beam and depth of all four being within two inches the same. The engines were 425 nominal horse-power. All four were wooden ships driven by paddle wheels, and rigged as three-masted schooners, with square sails on the foremast. Great care was taken to design ships thoroughly capable for the work, a fact that should be noted, as throughout the history of this great shipping company attention to design of ship and engine has been one of the main secrets of success. All the ships were built on the Clyde, and the engines were constructed by Robert Napier.

It was in the year 1840 that the new company commenced running a service that has continued uninterrupted ever since; nor can one over-estimate the importance, not only to the shipping industry, but to the world at large, of the services rendered by this undertaking. By method, skill and care, regularity, speed, despatch and safety combined with an ever-increasing comfort have been obtained. The greatness of the success of Mr Cunard and his partners can only be grasped when a comparison of their work is made with that of some of their less fortunate competitors.

The average speed of these steamers was about 8½ knots per hour, on a consumption of about 450 tons of coal from Liverpool to Boston. The Company succeeded from the first, and within four years so greatly did the trade develop that two more steamers were added to the fleet. In 1848 four others—the *America*, *Canada*, *Europe*, and *Niagara*, each of about 1820 tons and a speed of 10¼ knots—were needed to satisfy the growing requirements of the service. Not only was the Great Western Company of Bristol spurred to fresh effort by the success of the Cunarders, but the owners of the American clipper ships foresaw that unless they made a move, the supremacy that they had held so long and so deservedly for the carriage of mails and passengers would pass to the other side of the Atlantic. The situation, when considered, showed that a regular speed of about 8 or 9 knots guaranteed by steam-power was superior to a sailing ship, because although the latter might be capable of sailing double that speed with a fair wind, yet owing to variable winds she was liable to suffer great reduction of average speed; nor was it possible to run mails and passengers according to a fixed time-table. Hence it occurred to the American ship-owners that if they could retain sails for favourable winds, and so obtain a speed far in excess of anything a steamer could then hope to travel, and have an auxiliary engine by means of which a moderate speed could always be maintained, then the advantage would once again be on the side of the clipper. It was a perfectly sound conclusion, and theoretically at all events, quite workable. No sooner thought of than attempted; the Americans in the year 1845 fitted the clipper ship *Massachusetts* with an auxiliary screw propeller, and were thus the pioneers in a type of vessel that after many vicissitudes is still considered by some people to be capable of competing under certain circumstances with steam.

The *Massachusetts* was a full-rigged ship of 751 tons, capable of carrying thirty-five first-class passengers in her long poop. In spite, however, of what seemed theoretically possibile, the experiment with auxiliary sailing ships to compete against steamers for the North Atlantic trade was a failure. Still the Americans determined to continue the contest; if auxiliary sailing ships were a failure, had not the Americans designed and engined craft for river, lake and coast services which were the finest and fastest in the world? If they could build successfully for the coasting trade, why not for the greater trans-oceanic service? The story of the early American failure to compete against the Cunard Company, though fairly well known, is worth repetition. The first line to compete was organised to run from New York to Bremen, touching at Southampton. The first steamer of this line was called the *Washington*. She and the *Britannia* engaged in the first steam race between ships of two flags across the Atlantic. The *Washington* sailed from Boston for Southampton on the same day that the *Britannia* left New York for Liverpool; on paper the *Washington* was the more powerful ship, but the *Britannia* beat her by two days.

After this the United States Government determined to make a great effort to regain by means of a subsidised line of steamers the coveted supremacy. This led to the formation of the unfortunate Collins Company. Mr E. R. Collins of New York, who had successfully managed a line of sailing clippers between New York and Liverpool, with the assistance of several American friends, arranged to organise a fleet of steamers to carry the American mails. The steamers were to be of the highest class, and in advance of anything yet launched. The advice of the most skilful shipbuilders and marine engineers in the States was requisitioned, and after exhaustive consideration, five steamers were designed, by means of which it was confidently hoped that the Cunard boats would be run off the service. The United States Government made an agreement with the new company, the main features of which were that twenty voyages should be completed each year. This would require five steamers, and the subsidy was about £5000 per voyage. Thus the Collins line was to have £100,000 a year, as against the Cunard Company's subsidy of £81,000. Four steamers were immediately ordered; they were named the *Arctic*, the *Atlantic*, the *Baltic*, and the *Pacific*. They were to be novel in many respects;

in size they were to be greater than anything yet built, except the *Great Britain*, each ship measuring 3000 tons, with engines of 800 horse-power. The hulls were massively built of oak planked with pitch pine, the framing being additionally strengthened by ironwork. No expense was spared in either hull or engine; alterations were made in the latter during construction, owing to facts about the Cunard steamers coming to the knowledge of the designers. The original estimates were very considerably exceeded; however, in return for a guarantee of extra speed the Government gave the Company further financial assistance, and increased the subsidy to nearly £179,000 a year. One cause of the failure of this Company becomes clear as one reads the account of the building of their steamers. Business considerations apparently received but scant attention; everything was subordinated to producing the finest and fastest steamship regardless either of the initial cost or of the expense of working.

The Collins steamers began running in the year 1850. A war of rates ensued. The practical monopoly of the Cunard Company had resulted in freights of £7, 10s. per ton being charged; in about two years this rate was reduced nearly fifty per cent. In speed the Collins steamers beat the Cunarders, and so obtained a majority of the passengers, but it was at a ruinous cost. In the year 1851 the *Pacific* made the crossing in nine days twenty hours, thus reducing the time at sea very considerably. For four years, too, these steamers sustained no serious accidents; and as both the passenger and goods traffic were increasing at a rapid rate, there was a superficial success. The Cunard Company, however, by no means gave up the contest. In the year 1850 the *Africa* and *Asia* were added to their fleet; they were sister ships of over 2000 tons, but still not quite equal in speed to the Collins liners. The competition was healthy and did much for the improvement in the design of both hull and engine. There was great excitement on both sides of the Atlantic, accompanied by some heavy betting on the performances of the several ships. In the year 1852, on an average, the Collins boats saved some fourteen hours each trip over the Cunarders. But to make a long story short, the English Company by the construction of their first iron steamer, the *Persia*, in the year 1855, successfully met any possible competition for some years to come. Meantime the Collins line had suffered misfortunes; on the 21st September 1854, their steamer *Arctic* collided with a French steamer, the *Vesta*, and foundered four hours later. Of a company of 135 crew and 233 passengers only 45 survived. Among the passengers lost were many well-known business people; Mr Collins lost his wife, son, and daughter. The captain, who was the last to leave the ship, was among those saved.[1]

[1] As a result of this collision it was made compulsory for all ships to carry side-lights, *i.e.* a red light on the port bow and a green light on the starboard bow. Prior to this it had been customary to carry a single light on the bowsprit end.

Within eighteen months of this disaster the *Pacific* was lost. What happened to her can only be conjectured: she sailed from Liverpool on January 23rd, 1856, with a complement of 141 crew and 45 passengers. The probability is that she foundered after collision with an iceberg—a victim perhaps to the insane desire for speed, which then, as now, was one of the unfortunate features of Transatlantic voyages. The Collins Company displayed a bold front, and built a steamer even finer than any of the others, the *Adriatic*. But financial trouble led to the winding up of the Company in the year 1858. The history of the Collins Line emphasises the fact that in order to compete successfully, and at the same time avoid financial loss, a steamship company requires, in addition to fine ships and powerful engines, good business management. Both here, and later in connection with the *Great Eastern*, the work of the engineer and shipbuilder ended in failure through business ineptitude. Those responsible for the conduct of the world's business know the value of that remarkable entity familiarly known as the capable business man, sometimes called the Captain of Industry.

CHAPTER VII

LONGER VOYAGES AND LARGER SHIPS

THE story of the international competition for the supremacy on the North Atlantic has brought us to the year 1858. It is now necessary to return for a moment and trace out some other developments equally important in the history of shipping. The name of a great engineer became connected with ship designing about the year 1840. This was Mr I. K. Brunel, whose father, a native of Rouen, had settled in England and gained considerable repute as an engineer and scientist. I. K. Brunel also became an engineer, and assisted his father in the construction of the Thames tunnel, then planned and constructed the Clifton suspension bridge; and in the year 1853 was appointed engineer to the Great Western Railway Company, for which he designed and constructed all the bridges and tunnels, and persuaded them to adopt the broad gauge for their track. In addition to this he had a great deal to do with the construction of many of our ports and docks, notably at Bristol, Cardiff and Milford Haven. He and Mr Patterson of Bristol were apparently jointly responsible for the design of the steamer *Great Western*, the first steamship specially built to cross the Atlantic, and it was the success of this vessel that led the Directors of the Company to decide on building another ship to be both finer and larger, and to include two great developments. The hull was to be built of iron, and the engines were to drive, not paddles, but a screw propeller. This ship, the *Great Britain*, originally planned as early as the year 1839, was completed in 1843, and her construction may well be looked upon as marking an epoch in marine architecture. Neither the designer nor the builder had any precedent to go upon. The building of this vessel, without any exaggeration, may be described as *creative*. No craft of such dimensions had ever previously been conceived, moreover the *Great Britain* was built of iron, a new and almost untried material. As an instance of what difficulties and expenses had to be faced, the rivet holes in frames and plates, now easily punched out by machines working at considerable speed, then, in default of machinery for the purpose, had to be *drilled by hand*. The total cost of this vessel was upwards of £120,000.

The *Great Eastern* is the monster undertaking always associated with the name of Brunel, but in reality the audacity and the need for resource in the building of the smaller vessel must have been even greater than those required for the construction of the greater ship, although the latter was nearly six times the dimensions of the *Great Britain*. Every detail had to be thought out and decided upon, new methods of construction, new tools, new means of handling material, and finally when all had been successfully accomplished, the launching must have severely tested the skill of both engineer and builder. When once it had been shown that a large ship could be constructed of iron, the mere increase of dimensions, doubtless, created certain difficulties, but there was a certain experience to go back upon. In the building of the *Great Britain* a constant resource, and a ready originality in deciding ever recurring problems, was continually in demand. The success of this ship was complete, for she proved to be a fine sea boat, then when unfortunately stranded on the Irish coast she proved the suitability of iron for ship construction, and lastly when she had served her purpose as a steamer, her engines and boilers having been taken out in the year 1883, she did good service as a sailing ship, ending her days as a coal-hulk at the Falkland Islands after an eventful and useful career of nearly sixty years. After taking five years to build, she left Liverpool in July 1845 for her first voyage to New York, where she arrived in fourteen days twenty-one hours. Subsequent modification to her machinery and a new propeller resulted in increased speed. A steamer like the *Great Britain* was run at very great expense, her consumption varied between 35 and 50 tons of coal per day, and when in the Australian trade she would burn as much as 1200 tons of coal between Melbourne and the Cape of Good Hope. But her unfortunate accident in Dundrum Bay led to the winding up of the Great Western Company, which was feeling the competition of the successful Cunard Line very keenly.

No sooner was it proved that the marine engine was capable of crossing the Atlantic than even more ambitious schemes for its utilisation were mooted. But for some time such schemes had to remain castles in the air. The early marine boilers consumed large quantities of coal, and as yet there were no conveniently arranged coaling stations where steamers could replenish their bunkers. Hence a voyage to the Far East or to Australia was difficult to perform, though not actually impossible. After all, too, commerce is business, and for long voyages, sailing ships were more economical to run, and thus could undercut steamer rates very considerably. Two things were required before steamers could compete with advantage for long ocean voyages against sails: there must be a greater economy in the use of fuel, and for this purpose both engine and boiler must be greatly improved; and secondly, for a continuous and satisfactory system of steam communication all over the world, there must be established at convenient distances along the routes efficient coaling stations. Not until both these were accomplished facts had sailing-ship owners anything to fear, but when once science, engineering skill and commercial energy had overcome these obstacles, the days of the sailing ship were surely numbered, and far-sighted owners, noting the signs of the times, began to sell their ships, and either retired or established steamship lines. The process of displacing the sailing ship was, however, a long one, extending over well-nigh half a century. Many improvements in engine and boiler were needed before the longer sea voyages could be attempted by a steamer in fair competition with a sailing ship. But that the passing of the sailing ship was inevitable, was realised long before it actually came to pass. In this the shipping community went through an experience very similar to that common to other great industries when passing through a great period of transition due to some epoch-making change.

It is very seldom that a great change in any method of production or transport comes suddenly, making a great break with the past. Changes, even the greatest, usually work comparatively slowly, and give both the labour and capital connected with the industry concerned time to accommodate themselves to the altered circumstances. This lessens hardships and losses, but it does not eliminate them, it only offers the opportunity for doing so; the workman or capitalist who refuses to keep abreast of the times, as we say—that is who ignores the change and its possibilities—suffers loss, but he has usually had sufficient warning of what was coming, and could have avoided the trouble had he used ordinary foresight. The fact that Englishmen, as a rule, do foresee the course of events and take means to secure the benefits that may accrue, is one of the great causes of our commercial and industrial success.

As early as the year 1825 two attempts had been made to steam to India. The previous year, a subscription having been raised in India, a prize of £8000 was offered to the first steamship which should make the voyage from England to India within a certain number of days. In answer to this the *Enterprise*, of 470 tons and 120 horse-power, built at Deptford, sailed from Falmouth on August 16th, 1825, and after a long passage arrived at Calcutta on December 8th. Out of the 113 days, one account says that 103 were under steam, another that she was 63 days under steam, 40 days under sail, and 10½ days coaling. Her average speed was 8¾ knots. Shortly after this an auxiliary steamer, the *Falcon*, of 176 tons, was sent to Calcutta as a speculation, in the hope of selling her at a profit to the Government. This expectation was not realised, and as steam was as yet an unknown quantity, the engines and boiler were taken out, and the *Falcon* became a sailing ship and ran in the opium trade.

These two experiments proved the possibility of steaming to India, but they cannot be called business voyages. A business voyage must be commercially successful. Had steamers like these two been able to carry cargoes in competition with the typical sailing ships of the day, there would have been an immediate revolution in the trade to the Far East. What resulted was that it was proved to be possible at comparatively great expense to run steamers on long ocean voyages. For the carriage of mails and for wealthy travellers this possibility could be utilised. Business letters weighing half an ounce and paying a fee of one shilling, if obtainable in large numbers, would pay the extra expense necessary for the regularity which had now been proved to be obtainable. To a wealthy merchant, or in the case of an important Government official, or army officer requiring to get to India as speedily as possible, expense would be a minor object. Hence steam, even in its most extravagant days, was utilised for the conveyance of mails and passengers by vessels which could not have competed with sailing ships for cargo purposes, or even for taking emigrants to Australia.

It was facts like these that led to many erroneous ideas as to the capabilities of steamers, ideas that had a long life, engendering prejudices hard to overcome. For a long time it was accepted as a fact that steamers were only fit for certain trades, and that long voyages must always be performed by sailing ships; that bulky goods like cotton would never be economically carried by steam. The owners of the American sailing packets made a long and courageous fight for this trade, but by 1860 the position was practically hopeless. In the Indian trade this last opinion not only existed, but had some foundation in fact, owing to the conditions of the trade, and indeed, until quite recent years, sailing ships continued to carry cheap, bulky goods from the Far East. Other prejudices which had to be lived down existed in some trades, notably those connected with the carriage of fruit and tea. The fruit merchants were persuaded that fruit sent by steamer would suffer in flavour; this theory also spread to China, and was applied to the transport of tea, which it was confidently asserted must always be carried by sailing ships, or its flavour would be ruined. There was some method in the practice of the fruit merchants, at any rate they convinced themselves that by exporting small quantities in sailing schooners they would reap a double benefit—a readier market and higher prices.

In spite, however, of theories and prejudices, steam gradually won its way, and when once the business possibilities connected with steam were realised in connection with any trade, sailing ships were taken off, and either sold to the foreigner or put on another route. Thus the history of shipping during the past half century consists of a series of improvements in the steamer which has enabled steam to take over trade after trade from the sailing ship, until at the present moment the steamer has reached such a point of perfection that although the future will undoubtedly bring further developments in the motive force, and in the construction of ships, the point has been reached where the steamer is the superior of the sailing ship for every trade and from every point of view. It used to be thought that the sailor could only receive his training in a sailing ship, the latest thought,[1] however, questions this view, and it is now asserted that the sailor can learn his profession as efficiently in steam as under sail. Thus the sailing ship is for practical purposes a negligible quantity, although a number of fine vessels are still maintained at sea, especially by foreigners.

It has been seen how the North Atlantic trade has been gradually taken over by steamship lines. It will be equally interesting to trace out how other trades were one after the other taken over by the steamers.

The first thing was to get a mail and passenger service. This entailed the establishment of repairing yards and coaling stations at convenient points on the various trading routes. And when these were successfully in being, the coming of the tramp steamer and the intermediate liner to take away the trade from the sailing ship was only a question of time. This work, so far as the Far East and Australasia are concerned, was in the first instance carried out by the Peninsular and Oriental Steam Navigation Company. It almost sounds like a romance that this famous Company should have owed its origin to a firm of stage-coach proprietors in Dublin, and yet this is a fact. Messrs Bourne of Dublin, owing to their contract for carrying the mails in Ireland, became the chief proprietors of the Dublin and London Steam Packet Company,

[1] *The Liverpool SS. Owners' Report*, 1913.

one of the first companies to make use of the marine engine. The steamship *Royal Tar*, belonging to this Company, was chartered by the Spanish Government, through Messrs Willcox & Anderson, a firm of shipbrokers in London. The service rendered by this vessel was so satisfactory that the Spanish Ambassador persuaded Messrs Bourne to establish a line of steamers to run from London to the Peninsula, and of this line Messrs Wilcox & Anderson became the London Agents. This beginning developed into a regular steamship company called the Peninsular Steam Navigation Company. At this time the Portuguese mails were carried by sailing craft leaving Falmouth once a week, but the service was irregular and unsatisfactory. The Spanish mails were carried by a Government steamer with greater regularity, but the new line had faster boats. Thus as soon as the new service was running regularly, merchants and others interested in this trade felt that a change ought to be made, and that the mails should be sent by the more efficient service. The managers of the new line, willing to expand their business, drew up a scheme for a more efficient mail service, and submitted it to the Government. At first, however, they received no encouragement, but the trade proving profitable, they quietly continued to expand the scope of their operations. The line was from the first thoroughly well managed, attention to regularity and detail making it increasingly popular among traders and travellers. At the same time the inefficiency of the postal service was by contrast made more and more obvious. At length the Peninsular Company was asked to submit a scheme for a better mail service. This, as presented to the postal authorities, included a weekly service between Falmouth and Vigo, Oporto, Lisbon, Cadiz and Gibraltar. This would necessitate the construction of more steamers, but the sum mentioned in the contract showed a saving of over fifty per cent. on the existing unsatisfactory arrangement. Competing tenders were advertised for by Government, and after negotiations with another company, the contract of the Peninsular Company was finally accepted in August 1837. From then the mail service to the Peninsula became reformed. The first mail steamer to run from Falmouth under this agreement was the *Iberia*, a paddle steamer of 516 tons and 180 horse-power, built in London. The first mails left Falmouth in September 1837. From this moment the mails as far as Gibraltar were run on a satisfactory basis, but the carriage of the more important mails for the Near and Far East were still organised on an old-fashioned and out-of-date system. Prior to the year 1840, the Indian mail was carried by Government steamer from Gibraltar to Alexandria, thence overland to Suez, and by East India Company's steamer to Bombay. The Peninsular Company carried the Indian mails to and from Gibraltar from the time of its establishment. But owing to the slowness of the permanent steamers on the Mediterranean, and the many stopping places included in the Peninsular Company's contract, the Indian mail took about a month to reach Alexandria. Bad as this was, it was rendered worse by an arrangement entered into by the English and French Governments for the conveyance of part of the Indian mail overland through France to Marseilles, and thence by Government steamer to Alexandria via Malta; the two parts of the mail overlapped, and there was thus created an extraordinary situation. To improve this state of affairs, the Government sought the advice of the Peninsular Company, which went into the question and submitted a scheme for running the Indian mail direct by steamer from England to Alexandria, touching at Gibraltar and Malta. Tenders for this service were invited, and of four sent in, that of the Peninsular Company, being the lowest, was accepted. To comply with the conditions of the contract two new paddle steamers were bought by the Company: the *Oriental*, 1787 tons and 420 horse-power, and the *Great Liverpool*, 1311 tons and 464 horse-power. The Company then formed became the Peninsular and Oriental Steam Navigation Company, a title which has not since been altered. From the *William Fawcett*, the first steamer belonging to the Company, a paddle boat of 206 tons and 60 horse-power, to the *Oriental* of nearly 1800 tons, was a great advance to be made in a few years—the full effects of the improvements made both in marine engineering and marine architecture can be realised by comparing the *William Fawcett* with the *Maloja*.[1]

[1] *Cf.* p 105

The steamers for the Indian and Australian trades have not attained the huge dimensions of those employed on the North American routes, but in perfection of design, efficiency of machinery, and real comfort, they are unequalled. The dimensions of the Suez Canal and the depth of water at some of the terminal ports have hitherto limited the dimensions of shipping for these trades.

CHAPTER VIII

STEAM TO THE FAR EAST AND AUSTRALASIA

The satisfaction and regularity resulting from the well-organised system running between England and Alexandria led to yet further improvements, and in these the P. and O. Company led the way. There was still no canal joining the Mediterranean and the Gulf of Suez, so that from Alexandria both passengers and mails had to take what was known as the overland route. This entailed a journey of 48 miles in a canal boat, and then driving 90 miles across the desert in a two-wheeled omnibus accommodating six persons, a by no means pleasant experience. In the year 1842 the P. and O. Company's tender for running the mails from Suez to India was accepted, and at the same time that their new steamer, the *Hindustan*, of 2017 tons and 520 horse-power, arrived at Suez to undertake this new service, a superior type of steamboat was put on the lakes to improve the *overland route*. With the appearance of the *Hindustan* one contractor became responsible for the entire route to India, and shortly afterward the route was extended to Penang, Singapore and Hong Kong. Meantime the directors of the East India Company had jealously maintained their monopoly of the Bombay to Suez route, nor was it until the year 1854 that this also was taken over by the mail contractors.

The type of ship was being constantly improved, and although it is not possible to mention each addition to the Indian service, one ship, the *Himalaya*, deserves notice. The *Himalaya*, built in the year 1853, was of greater measurement than any steamer yet owned by the P. and O. Company, namely 3438 tons; she had powerful engines of over 2000 horse-power, and was the first steamer in the Indian trade to be furnished with a propeller.

Shortly before the establishment of a regular mail service to India, the Australian Colonies had offered a prize of £500 for the fastest steam passage to Australia. To compete for the prize, in the year 1852 Mr I. K. Brunel had designed, and Mr Scott Russell had built, two fine screw steamers, named the *Victoria* and the *Adelaide*, for the Australian Royal Mail Steam Navigation Company. Their dimensions were: length 261 feet, with a beam of 38 feet, measuring 1350 tons gross register. They had detachable screw propellers which gave a speed under steam of 11·66 knots on a consumption of 37 tons of coal a day. The *Victoria* won the prize, making the run from Gravesend to Adelaide in sixty days, including two days' delay at St Vincent. Her engines were designed to give a speed of 10 knots under full steam—in actual working the average speed was 11·66 knots. The hull of the ship was designed to provide ample passenger accommodation, and as much cargo space as possible, allowing for the necessary bunker space. The entrance and run of the ship were of the wave line form—an idea of Mr Scott Russell's—while the 45 feet amidships were parallel; the bilges were round, the topsides tumbled home. The hull was divided into twelve water-tight compartments, and there were longitudinal bulk-heads carried through the engine and boiler rooms so as to separate the coal from the machinery. The ship had masts and carried a spread of 1540 square yards of canvas. The heavy expenses incurred in running this type of steamer made it impossible to employ them on a paying basis in the Australian trade, and it was this apparently that suggested to Mr Brunel the idea of building the *Great Eastern*—a ship so large that she should be able to carry a large number of passengers, a sufficient quantity of cargo to be (theoretically) a paying proposition, and at the same time be able to carry enough coal to steam from England to Australia without replenishing her bunkers. The building of this ship marked the highest point attained in naval architecture for several decades, for it was not until the year 1901 that the dimensions of the *Great Eastern* were exceeded by any ship, British or foreign.

About the middle of last century trade and commerce passed through a period of very rapid transition. Steam had revolutionised methods of manufacture, the locomotive had had a similar effect on travel and transport by land, and now the marine engine was beginning to work a great change at sea. But at the outset many and great were the difficulties which had to be faced, and many a decade had to elapse before the marine engineer could effect at sea what the railway engineer had accomplished ashore, namely secure practically the whole of the transport of both passengers and goods over long distances. The locomotive had done this on land in less than a quarter of a century, a record which spurred men like I. K. Brunel to make great efforts. In 1848 there was the gold rush to California, and early in the 'fifties gold was discovered in Victoria and there was a rush to Australia. Both these events had very considerable effects on trade; the trade of the world was developing as it never had done before, and the possibilities for further progress appeared to be unlimited. Steam communication, giving speed and regularity, had been established between Europe and America; several successful lines of steamers were now in operation, trading to both Canadian and United States ports. Moreover, steam had reduced the journey from Europe to the Far East. It is true that there was the annoying break from Alexandria to Suez, but from Western Europe fine steamers carried passengers and mails to Alexandria, and the voyage from Suez to India and China was now performed by an equally regular and satisfactory service. Even the overland route had been robbed of more than half its discomforts, and the railway across the Isthmus so long projected was nearing completion. The discovery of gold vitally changed the prospects and condition of Australia. A new type of settler was attracted, and a new spirit was infused into the whole community, which would demand more consideration both from Government and from shipping companies. The old-fashioned sailing ship had sufficed to meet the needs of an agricultural community, but even that had been getting restive owing to the irregularity of the mails and the uncertainty of communication. There was as yet no submarine telegraph. Sydney was becoming an important city, Melbourne, though hardly in her teens, was making a position for herself, and other towns were progressing. Unless it was humanly impossible, the steamer must link up Australia with the rest of the world, and more particularly with Europe. This is the explanation of the prize offered by the Colonies to which reference has already been made. The prize was offered, but the circumstances under which it had been won showed that unless some great improvements could be effected in ship and engine, regular steam communication between England and Australia was not as yet an economic possibility.

There had been a report by a Government Committee in 1851 in which it was recommended that further tenders should be invited for the East Indian and Australian mails. Among the offers sent in was one from a new firm—the Eastern Steam Navigation Company—to carry the mails by a monthly service from Plymoutb to the East Indies, and to Australia by the Mediterranean and Indian Ocean. The ships were to measure from 1300 to 2000 tons, with engines of about 500 horse-power. The offer, however, did not state what subsidy would be required, and probably on this account was not accepted. The Directors made known to the shareholders the result of their offer to the Government, and it was a question whether the Company should be definitely established, and carry on the usual business of a steamship line without a mail subsidy. Mr Brunel, who was the engineer to this Company, made the suggestion that instead of building a fleet of ordinary steamers, to compete on ordinary terms with the shipping already in existence, the Company should make a great step in advance by building a steamer of five or six times the capacity of anything yet afloat. He was satisfied that a vessel of 20,000 tons, if fitted with adequately powerful machinery, would possess many advantages over the steamer of 2000 or 3000 tons. Such a ship once in motion would be more easily propelled, the result being greater speed with less consumption of coal. His theoretical ship would easily carry sufficient coal to steam to Australia, would have a speed of about 15 knots, would, in addition to bunker space, have good cargo carrying capacity, and be able to accommodate a large number of passengers. The Directors of the Company, on the strength of Brunel's figures, considered the commercial probabilities. The result of their deliberations was that great ships as planned by Brunel would reduce the voyage to Australia to about 45 days, and after including in their estimates what they imagined were liberal allowances for working expenses, depreciation, and wear and tear, they confidently predicted dividends to the extent of forty per cent. per annum on the necessary capital. It is easy now to look back and say that Brunel was an enthusiast, and that he was half a century in advance of the time, or that though big ships were bound to be the rule, there was not sufficient trade to warrant the building of such craft in the midde of the nineteenth century. To understand the position at that time one must try to forget subsequent events and inventions. The situation facing the believers in Brunel's scheme was briefly, that only steamers assisted by a Government subsidy could be kept running owing to the heavy expenses then incidental to the business. And even with Government help, it required the best business management to avoid loss. The heavy consumption of coal necessitated very large bunker space, and this reduced cargo space, and so gross receipts. Thus to make the steamer a commercial success, either the engines must be improved so as to gain greater speed at a less consumption of coal, or a type of ship must be designed that would carry a maximum of freight and require a minimum of the present type of engine and boiler to drive her through the water. In other words the compound engine, or the *Great Eastern* would be the solution of the difficulty. The compound engine having not yet been invented, Brunel's plan for a vessel of large tonnage, carrying a large cargo and many passengers, was by no means so unreasonable as many people since the failure of the *Great Eastern* have declared. In fact as one reads the history of the *Great Eastern*, the fiasco of the launch, with its enormous cost—£120,000—a dead loss which really ruined the Company before the ship was equipped for sea; the shilly-shally policy pursued by the Directors when the ship was ready; the fatuous trip across the Atlantic of a ship built for the Far Eastern and Australian trade; when all this is considered, one may agree that perhaps there may not have been sufficient trade at the time for so big a vessel, but there was a vast amount of business ineptitude and commercial cowardice connected with the policy of the management, from which only failure could result. Would such erratic and purposeless management make a success of the big ships of to-day? These considerations, however, concern a later portion of this book.

Brunel's scheme was placed before the shareholders, many of whom feeling doubtful of it withdrew their support from the Company. However, sufficient capital was raised to warrant the placing of the order with Mr Scott Russell of Millwall, London, for the *Leviathan*, as the first of the big ships was originally called; the name later on was changed to the *Great Eastern*.

The work of construction commenced on the 1st of May, 1854, and the ship finally floated on January 31st, 1858. Up till that moment a ship of about 375 feet long, and measuring 3300 tons gross was the largest iron vessel that had been built. The *Great Eastern* measured 18,914 tons gross, and had a displacement of over 27,000 tons, her length was 680 feet, extreme beam 82·5 feet, coal capacity 10,000 tons, cargo capacity 6000 tons. She had accommodation for 4000 passengers of all classes, and although it was never attempted, it was calculated that she could have carried 10,000 troops. The hull and paddle engines were constructed by Scott Russell, the propeller engine by James Watt & Co. of Birmingham. The model was, in accordance with Scott Russell's theories, on the waveline principle, with a long parallel section amidships. Brunel was responsible for utilising both paddles and a screw propeller, and in the construction of the hull he introduced a new principle which rendered the ship practically unsinkable. The experience of the girder work in the construction of the Menai Tubular Bridge suggested to him the cellular system of ship construction. Thus the *Great Eastern* had a double skin with a space of over 2 feet 6 inches between the plating, and the double skin was carried from the water line to the keel; the main deck was also cellular. The reconstructed *Olympic* (1913) has also a double skin; had the *Titanic* been built on this system, the probability is that she would not have foundered. The *Great Eastern* was immensely strong, she had transverse bulkheads every 60 feet with no openings in them below the second deck, and there were additional bulkheads at the bow and stern, which made her probably as safe as anything that human ingenuity can devise. There is, too, a consensus of opinion that the workmanship in every detail of the vessel's construction was above criticism. Originally the *Great Eastern* was steered by hand, an efficient apparatus for the purpose was by no means easy to produce. Indeed with the growing size of ships a great difficulty had been encountered in connection with satisfactory steering. The rudder might, and sometimes did, take charge of the man or men at the wheel. To obviate this, various appliances had been tried. The idea of working the rudder of large steamships by steam-power had long exercised the brains of engineers. Finally a successful steam-steering apparatus was invented by Mr MacFarlane Gray: the first of these machines was fitted to the *Great Eastern* in the year 1867. Thus she was the pioneer ship in the use of the steam-steering gear.

By building the *Great Eastern* England had produced the largest and finest ship the world had ever seen, the finest example of marine architecture and marine engineering, and had advanced the art of shipbuilding by half a century at one step. It was not only the work of construction, but also the work of launching that gave the builders and designers anxiety. The ship was built parallel with the river, and the launch was attempted side-ways. Her weight on the launching ways was not less than 12,000 tons. This immense weight rested on two cradles, each of which was about 80 feet square. These cradles were expected to slide on ways 80 feet wide and 200 feet long, with a slope of one foot in fourteen. When the actual launch was attempted the ship only moved a few feet, and then remained fast; after three months' work with hydraulic presses and a very large expenditure of money, the ship finally floated herself during a high tide. Then financial difficulties delayed the work of equipping the ship for sea, so that it was September 1859 before she was ready for her trials. Her first voyage was across the Atlantic in June 1860. During this trip her maximum speed was 14½ knots, with an average of 14 knots, on a consumption of 12¼ tons of coal an hour. The experience of running her across the Atlantic with passengers and cargo was that she did not pay. Her best work was done between the years 1863 and 1874 laying submarine cables—this she accomplished with great success, indeed the picking up of the broken cable 1000 miles from Valentia and at a depth of two miles is one of the romances of marine cable work. Between the years 1874 and 1888 the *Great Eastern* was a White Elephant so far as her owners were concerned; in the latter year she was sold to be broken up, and in 1890 the last of this fine vessel disappeared on the river Mersey.

Nearly forty years were to elapse between the launch of the *Great Eastern* and the laying down of the keel of a ship of similar tonnage. The main reasons for this were first of all that the unfortunate commercial experience of the *Great Eastern* frightened shipping people, but more important still, the compound engine was invented whilst the *Great Eastern* was on the stocks. If only Brunel and Scott Russell had acted as the builders of the *Great Britain* did fifteen years before, and had adopted the new and improved type of engine while the ship was building, it is just possible that the career of the *Great Eastern* might have been different. Had the ship possessed the double advantage of increased cargo space per horse-power, and increased horse-power per ton of coal consumed, the trips across the Atlantic, instead of resulting in loss, might have shown new possibilities, and the era of the large ship might have commenced with the *Great Eastern* half a century ago; at any rate in the North Atlantic trade. However, this possibility was not acted upon; the ship was a bad failure in the eyes of the shipping community, and the compound engine was fitted to vessels of smaller tonnage, better suited to the existing conditions of shipping trade, with very remarkable results.

The application of the compound principle and surface condensation to the marine engine may almost be compared in its important results with the invention of the forced draught to the locomotive engine. During the last years of the eighteenth century and the early years of the nineteenth, colliery proprietors were experimenting with steam for haulage purposes. Horses dragging carts was a very slow method for dealing with large quantities of coal, and owing to the conditions of agriculture and the heavy duty on imported corn, horse feed was a big expense. Many experiments with steam traction were tried both in the West and North of England, but the fate of all the early locomotives was generally the same—a trial, and then conversion into a stationary engine.

George Stephenson was engine-man at Killingworth Colliery. He was interested in experiments in locomotive traction tried by Mr Blackett at Wylam-on Tyne. He persuaded Lord Ravensworth to allow him to build an experimental locomotive for coal haulage. The engine was built and run for a year. The results were fairly satisfactory, but on going into the question of cost it was found that over a period of twelve months the running cost of the engine and the cost of feed for horses doing the same work were practically identical. Thus though Stephenson had produced a locomotive that would do this work, there was no economic advantage in using it. Similarly at sea the old-fashioned marine engine could be constructed to drive a ship at a fair speed, the engineer succeeded so far, but the invention could only be employed on those limited services where cost was of comparatively little moment. For carrying ordinary cargoes the sailing ship, in spite of her uncertainty, held the advantage.

But George Stephenson, not being satisfied with his first locomotive, and its results, set himself to work to make improvements. He noticed that the steam issued from the exhaust pipe at a greater speed than the smoke from the funnel, and this suggested to him the steam blast which solved the problem of the locomotive. This was in the year 1815. In 1821 Stephenson was appointed engineer to the Stockton and Darlington Railway, then under construction, and there the locomotive for both passenger and goods traffic was first successfully employed, proving the great advantages in speed and economy of steam over horse traction; and within fifteen years the whole country was being covered with railways.

Similarly in the case of the marine engine, with low pressure steam and one cylinder, the amount of coal consumed averaged about 6 lbs. per indicated horse-power per hour. This, with but a very inadequate number of coaling stations on trade routes, necessitated a great coal bunker capacity on long-voyage steamers. This meant that such vessels could carry mails and passengers, but very little, if any, cargo. In other words, before the invention of the compound engine the steamer was not a commercial success.

The introduction and development of the compound engine is inseparably connected with the name of John Elder of Glasgow. He it was who, while the *Great Eastern* was still on the stocks at London, began fitting steamers with a new pattern of marine engine, in which higher pressure steam, compound cylinders, and surface condensation were combined. Many advantages resulted, the principal being that fresh instead of sea water was henceforth used in marine boilers, thereby considerably lengthening their lives, and the consumption of coal was reduced by one half. Then for about a quarter of a century there was hardly any further advance made except in detail. But in 1881, from the yard of the Napiers in Glasgow was launched the *Aberdeen*, the first steamer to be successfully fitted with the triple expansion engine, working at greatly increased pressure. The difficulties in the way of this improvement had been mainly connected with boiler construction; the invention of corrugated furnaces, and the employment of mild steel for boiler plates, obviated these. From that time increased working pressure, quadruple expansion engines, and the Parsons turbine engine have led to still further economies both in space and consumption until now, instead of burning six pounds of coal per hour for each indicated horsepower, the amount required is but little more than one pound.

From the moment that the compound marine engine proved its economy in working, there has been a steady succession of improvements in the steamer. These improvements progressed in connection with two different types of vessel. On the one hand there is the mail and passenger ship, and on the other hand the cargo steamer, in other words the liner and the tramp — two very important types of ship having important yet very different functions, the one giving remarkable facilities for travel, enabling a mail service of great speed and astonishing regularity to be maintained, reducing distance and opening up easy world-wide communication, the other transporting food, raw materials, and manufactured goods in ever-increasing quantities, and at extraordinarily low cost, opening up new trades, leading on to new combinations both as to trade routes and trade possibilities. The work of the cargo tramp has resulted in revolutionising the food and clothing, and in increasing the standard of comfort of the great mass of mankind— the effect being especially noticeable in old and densely populated countries, whilst at the same time these increased facilities have had a very great deal to do with opening up new countries, and especially in the development of the British Dominions beyond the sea.

CHAPTER IX

THE MODERN LINER

JOHN ELDER was the first to construct steamers fitted with compound engines; I. K. Brunel was the pioneer in steamers of huge dimensions; Samuel Cunard may be regarded as the initiator of ocean steam mail and passenger services; but Thomas H. Ismay was the practical business man who foresaw that there was money to be made out of attending to the comfort and luxury of the public who have to make ocean voyages. It was in the year 1870 that the White Star Line commenced running a regular steam service from Liverpool to New York. The original White Star Line consisted of some five American built clipper ships sailing to Australia. Ismay, Imrie & Co. succeeded to the business, and for many years owned both sailing and steam vessels. The building of the *Oceanic* by this firm marks an epoch in the passenger service between England and America. The early steamer, like early railway equipment, had followed the traditions of its predecessors. Two or three stage coaches fastened together and mounted on a bogie, giving the minimum of comfort and a maximum of inconvenience, and a small five-ton goods truck shaped like a carrier's cart, maintained a tradition which even yet among the railways of this country is not entirely a thing of the past. The sailing ship had developed castles at either end. The after castle or poop being the place whence the ship was navigated, and hence where the officers congregated, was the position of honour, and when passengers were carried, their accommodation was added to that required for the Captain and his mates. When paddle wheels took the place of sails, the poop was probably the most comfortable part of the ship for passengers, for though there was more motion there than amidships, one was far from the worst of the vibration caused by the machinery. When, however, the screw took the place of the paddle, it became a purgatory to have to sleep in a cabin just over the place where the screw was thumping and causing the maximum of vibration. However, for some years the old tradition was continued, passenger accommodation was constructed right aft, and passengers had to grin and bear the attendant inconveniences and discomforts. But Mr Ismay was not a man to be bound by any precedent. It was his business to attract passengers by attending to their creature comforts, and he realised that in steamers of ever-increasing dimensions the most comfortable place for passengers must be right amidships, just forward of the engine space. Hence he developed the possibilities connected with the navigating bridge and engine-house, and the new White Star steamers, in addition to their novel dimensions and characteristic stems, had their quarters for passengers placed where motion and vibration would be least observable.

The *Oceanic*, the first White Star Liner, had a length of 420 feet, but sailors were surprised that her beam was only 41 feet. These proportions were considerably criticised at the time, but proved their efficiency. This ship, with five similar vessels, the original fleet of the White Star Company, were built at Belfast; the engines, which were constructed at London, were of 3000 horse-power, giving the ships a speed of 14¾ knots per hour, a speed in excess of previous steamers of less tonnage but greater power, thus proving the soundness of the new dimensions. The success of the *Oceanic* and her sister ships led to the construction three years later of the *Britannic* and *Germanic*, both of which became very favourite ships on the Atlantic. They were built at Belfast and the engines at London, the cost being about £200,000 each. These vessels measured about 4800 tons gross and were 455 feet long, while the comparatively narrow beam was adhered to, the measurement in these two ships being 45 feet.

The rig was the same as the six earlier steamers, namely, four masts carrying square sails on all but the jiggermast; the average speed was 16 knots an hour, the fastest yet attained by an ocean steamer, and the coal consumption was 75 to 80 tons per day. The accommodation provided quarters for 1300 passengers of all classes, and a crew of 150 all told.

Then commenced a series of rivalries for size, speed, and luxurious passenger accommodation, which with but few intervals has lasted to the present day, and has finally produced the *Olympic*, the *Aquitania*, and the *Imperator*. In the year 1875 appeared the Inman Liner, *City of Berlin*, built by Caird of Greenock, with a speed equal to that of the *Britannic*, but of larger dimensions, her length being 489 feet between perpendiculars, and 520 feet over all. The Clyde builders were on their mettle, and showed their ability by the construction of three fine steamers for the Guion Line, the *Arizona*, built in 1879, the *Alaska* in 1881, and the *Oregon* in 1883.

The *Arizona* developed a speed of 16¼ knots. This urged the Cunard Company to renewed efforts, and as a result the *Servia* was built, a vessel of 7400 tons gross, and a length of 515 feet between perpendiculars. This ship was also constructed on the Clyde at Clydebank, and proved faster by a quarter of a knot an hour than any rival. With each new steamer the accommodation for passengers increased in comfort, indeed unheard-of luxuries began to make their appearance, and travelling on the Atlantic began to resemble life in a first-class hotel.

During the eighties the Inman Company made a bold bid for popularity by building in the year 1881 the *City of Rome*, at Barrow. This steamer had a speed of about 17 knots per hour, but hardly fulfilled the sanguine hopes of her builders and owners. All the steamers hitherto mentioned were propelled by a single screw, which meant that a serious breakdown with the engines reduced the liner to impotence, except for the assistance her sails might afford. Thus another epoch was marked when in the year 1888 this same Company produced two twin screw steamers, the *City of New York* and *City of Paris*. These vessels were novel in design as well as in propelling force. Their designer, Sir J. H. Biles, adapted the lines of a fast steamer built for the China trade, the *Stirling Castle*, which he had designed for Thomas Skinner & Co. The *Stirling Castle* developed a great speed, but was not a success commercially, and was sold when quite a new ship to Italian owners. The two Atlantic liners, afterwards named the *New York* and the *Paris*, were built at Clydebank. It was found at first that the twin screws were not so effective as the single screw, but with a slight alteration in design this was remedied, and the *New York* attained a speed of 19 knots per hour on 2000 less horse-power than at first had been required. The ill success of the *Great Eastern* with a measurement of nearly 19,000 tons had warned ship-owners off ships of big dimensions, and so for over thirty years no ship was built with a measurement equal to half that of the *Great Eastern*. With the *Paris* and *New York*, however, not only were the twin screws applied to the passenger and mail service, but a measurement of just over 10,000 tons was reached. These ships had five decks, each having an area of

27,000 square feet. The uppermost promenade deck presented ample opportunity for pedestrian exercise, five times up and down measuring one mile. The berths were unusually spacious and comfortable, the favourite ones being in deck houses. The dining saloons were a notable feature, a central dome had a few years previously been introduced to improve the architectural effect, which, when a height of about 8 feet was the maximum, had been anything but satisfactory, the general result being gloomy, and adequate ventilation a great difficulty. By developing the idea suggested by the dome, the saloons of the *New York* and *Paris* were quite remarkable appartments having satisfactory dimensions both from the architectural and hygienic points of view. This has been developed still further until liners like the *Lusitania* and *Imperator* possess numerous apartments which in dimensions are a match for anything that can be found in a town mansion.

The White Star Line about this time built another pair of steamers, the *Teutonic* and the *Majestic*, and again another regular step in advance was made. These vessels were 115 feet shorter than the *Great Eastern*, and their beam was 57 feet as against her 82 feet. The *Teutonic* was said to be the safest ship afloat, a longitudinal bulkhead throughout the amidship section of the ship, including the six largest compartments, separated the two engine rooms; the boiler space was also divided, and so were the bunkers. In this bulkhead there was but one door, and that was in the special charge of the chief engineer. There were also twelve transverse bulkheads, and any doors to these were controlled by automatic apparatus worked from the bridge by the officer in charge. It was calculated that if two of the biggest compartments on one side were filled with water, the effect would only be a list to that side of 12 degrees. The average speed attained was 20 knots an hour. The total cost of each vessel was about £400,000.

The Cunard Company during all this time had been quietly holding its own. The *Aurania* was built in the year 1883, a novelty in her construction being a greater proportional beam; she was followed by the *Umbria* and the *Etruria* in 1884; both these ships measured over 7000 tons, and were placed on the Admiralty list. Nine years later (1893) a great advance was made, the *Campania* and *Lucania* being constructed by this same Company. They both measured about 13,000 tons gross, and had a speed of 22 knots per hour, their cost amounting to between £600,000 and £700,000 each. This speed has, with the exception of the *Mauretania* and *Lusitania*, become the normal speed of the best Transatlantic mail and passenger steamers, including such vessels as the *Olympic*, and the *Imperator*. The cost of this speed when first attained in 1893 was so great that other companies were satisfied with a speed equal to that attained by the *Teutonic*. In the same way, at the present time, although the *Mauretania* and *Lusitania* have attained an average speed of 25 knots, equal to 28 miles an hour, the cost is so great that other companies are meantime content with the maximum of twenty years ago, a maximum that can now be attained with comparative economy. British ship-owners, indeed, after the building of the *Campania* and *Lucania*, for a time turned their attention rather to the improvement of the passenger accommodation—this was rendered possible by the greater dimensions of the steamers that began to be designed and built about that time. Thus in the year 1901 the White Star Line launched the *Celtic*, the first steamer to exceed the tonnage of the *Great Eastern*. The latter measured 18,914 tons gross, with a length of 680 feet. The *Celtic* is 20,904 tons gross, and is also 680 feet long. Dimensions like these give ample opportunity to a designer endowed with genius, to disregard old-time precedents, which in smaller vessels could not be greatly improved upon. There is sufficient space, however, now to allow the provision of gymnasia, swimming and Turkish baths, verandah cafés, and innumerable and even doubtful luxuries, for the travelling public. This class of ship, however, has proved most successful, and is very popular among passengers. The same Company, therefore, again increased the dimensions: the *Baltic*, built in 1904, measures nearly 24,000 tons, and the *Adriatic*, built in 1907, 24,500 tons, until the *Titanic* and *Olympic* were built measuring 45,000 tons gross, and the Hamburg Amerika

Company have in the *Imperator* commenced a 50,000 ton class of Atlantic liner. The *Imperator* herself has a length of 911 feet with a beam of 98 feet; she measures 52,000 tons, and is said to have cost £1,500,000. She has accommodation more luxurious than anything previously attempted, and is capable of housing no less than 4000 passengers, while the crew, all told, numbers 1100, giving a total population of 5100 souls all told when the ship is full. She has no fewer than eleven decks, and thus, like all the recent *greyhounds*, requires lifts for the convenience of passengers going from deck to deck. There is a winter garden on board, a Ritz restaurant, a theatre, a Roman swimming bath, a ball-room, a gymnasium, and so complete is the accommodation provided that a millionaire may, during the voyage, remain completely secluded in his self-contained flat, which possesses a private promenade deck. Luxury is being carried almost too far when all this is provided for a short trip of six days. The *Aquitania*, launched for the Cunard line at Glasgow on April 21st, 1913, will be equally luxurious. In length she comes within a few feet of the *Imperator*, 901 feet as against 911. Her measurement is considerably less, being 47,000 tons as against 52,000. In speed, however, although she will not be so fast as the *Mauretania*, she is expected to out-steam the *Imperator*, which so far has not attained the speed expected of her. Probably the builders need further experience in turbine engines. The *Aquitania* will be fitted to carry 3250 passengers, and a crew of 1000 all told. She has been built with an inner skin, and so is a ship within a ship, the space between the two skins being 15 feet wide, giving the utmost possible safety. Are these huge vessels the limit? This is scarcely likely, indeed most of the shipbuilding yards of the United Kingdom, capable of constructing ships of large tonnage, are preparing to build even greater ships. In Belfast it is said that the slips are being remodelled so as to allow the building of a vessel 100 feet longer than the *Olympic*. And an official at Southampton recently remarked that within three years, dock accommodation would have to be provided for steamers 50 per cent. larger than the present leviathans. For the moment, however, this pronouncement would appear to be a little premature, the projected extension of the Southampton Docks having been postponed for a time. There have been minor casualties, and a big tragedy which will probably cause a breathing space in the race for size. In this connection one important factor that has to be considered is the construction material. The use of steel has met many difficulties, but it must be remembered that in these very large ships the shell plates are no less than 1¼ inches thick, and the rivets needed for such plates are of large diameter, almost, if not quite, reaching the limit that can be knocked up by hand. And although mechanical tools might be able to tackle bigger work, the men object to too many automatic tools in shipyards.

Putting all these things together, it is just possible that 25 knots speed, and about 55,000 tons may remain the limits of speed and tonnage on the Atlantic service for the next few years at least.

The luxurious steamer has been most completely developed on the Transatlantic service in the past. Now, however, with increasing tonnage, the passenger liners to the Far East and Australasia promise to become almost as ornately fitted as the American. The original dimensions of the Suez Canal made it impossible until recent years to construct ships using that route of great tonnage. Thus at the time when the size of the Atlantic liner had increased to 10,000 tons, and the word comfort in respect of the passenger accommodation was replaced by the word luxury, the Peninsular and Oriental Company, to mark the jubilee of its foundation, which coincided with the jubilee of Queen Victoria in the year 1887, built four steamers, the *Arcadia*, the *Britannia*, the *Oceana* and the *Victoria*, measuring about 6600 tons each, with a length of 470 feet. Even at the present day, when the Atlantic can boast of at least one liner measuring over 50,000 tons, the largest of the Australian liners actually running is only about 13,000 tons, and the *Ceramic*, at present being fitted out for this route, measures about 18,500 tons with a length over all of 675 feet. This ship presents so many novel features both in design and equipment, and the conditions under which she is to run, that a rather detailed description of the ship and what she is to do may prove interesting.

The *Ceramic* has been specially built for the Australian trade, and will only carry one class of passengers. Thus while the passenger accommodation is all that can be desired so far as comfort is concerned, the profusion of luxury and expensive decoration, now the distinguishing feature of an Atlantic greyhound, is lacking. The saloons and state-rooms are large, airy and cool, and the decoration combines the best taste with simplicity. Of comfort there will be an ample supply, and even some luxuries are provided, for instance the two open-air swimming baths; but on a comparatively long voyage the need for these, and a gymnasium, is self-evident. The dining-saloon, which can seat 500 people at one time, is simply decorated in white, but its chief feature, and this is also the characteristic of the reading, smoking, and writing rooms, is airiness and comfort. This passenger accommodation marks a movement against the superornateness which to plain people does not make for either comfort or convenience.

For the safety of ship and life she has a cellular double bottom extending right out to the sides, with floors on every frame except in the fore and after holds, where the ordinary form is adopted. There are twelve transverse water-tight bulkheads carried right up to the upper deck. The water-tight doors in the engine and boiler spaces are of special design. Each door is held in position by a friction clutch which can be instantly released by means of a powerful electro-magnet controlled by the officer in charge on the bridge. The depth of the ship is 48 feet, divided into seven decks. A space measuring 310,000 cubic feet in her holds is insulated for the carriage of perishable cargo, and the hold is specially fitted for the carriage of copra. The number of passengers accommodated is 600, and there is space for a further 220. There will be life-boats for all on board, whilst submarine signalling apparatus and wireless telegraphy are both installed. The arrangement of the engines is interesting, there being two sets of reciprocating engines driving the wing propellers, and a low pressure turbine drives the centre propeller.

To represent the more usual type of the Far Eastern mail steamer, the *Maloja*, built in 1911, should be mentioned. This vessel measures about 12,500 tons, and is somewhere about 550 feet long. She is of the spar deck type, and has two funnels and two pole masts. The cargo space consists of six holds, four being forward of the engines and two abaft. Two of these and part of the 'tween decks are insulated for the carriage of perishable cargo. Accommodation is arranged for 450 first-class, 200 second-class passengers, and the crew numbers over 400 all told. The first-class state-rooms and the dining, music, reading and writing rooms occupy the best position in the ship on the four principal decks. The second-class accommodation is on the main deck. The first-class sleeping rooms include 40 single berth cabins, and most of the other first-class state-rooms are for two passengers only. The first-class dining-saloon runs right across the beam of the ship, and is seated for 320 people: the decoration is handsome, and at the same time ventilation and light are amply provided for. At the head of the main staircase stand two female figures in bronze, representing the progress made in naval architecture; one holds the model of a sailing ship typical of the past, the other the model of a modern mail steamer. A convenient feature of the arrangements is a model laundry capable of attending to the requirements of the passengers. For the working of ship and cargo there are ten hydraulic cranes, an anchor crane, and the usual steam windlass and capstans. The rudder is worked by a telemotor on the flying bridge. The main engines consist of two sets of inverted, direct acting, quadruple expansion, surface condensing engines, each having four cylinders working on separate cranks. There are four double-ended and four single-ended boilers for supplying steam to the various engines, all being fitted with forced draught, and working at a pressure of 215 lbs. to the square inch. The engines are controlled from the bridge by a telemotor, placed alongside the steering wheel. Here then is a vessel presenting many contrasts to the *Ceramic*, more luxuriously fitted, having accommodation for two classes of passengers, and rather resembling the best Transatlantic type of steamer, though of considerably less tonnage. The *Ceramic* is a more democratic type of ship, a type destined to become very popular with passengers bound to and from the democratic Dominions of the Pacific.

The Transatlantic and Australian liners have been described and their development sketched rather fully; the same evolution in type of ship, comfort and speed, could be traced in both the South African and South American trades, but this is hardly necessary here.

CHAPTER X

THE MODERN CARGO STEAMER

The invention of the compound engine solved the difficult problem of how to produce a cargo steamer which would be a commercial success. During the half century that has since elapsed, owners and builders have experimented in innumerable directions to produce the most economical steamship for each different trade. The result is that even the casual observer walking round a busy port at once notices the many and various types representing the modern cargo steamer. Experience alone could make plain the many difficulties in the path of the cargo steamship designer. A large space in the ship is necessary for the accommodation of engines, boilers, and coal bunkers. The allocation of suitable spaces for these has required the unremitting attention of the most highly skilled ship constructors. If the engines and boilers be placed right aft, when the ship is unloaded she will be considerably down by the stern. If they be placed right amidships, then owing to the tunnel that is necessary for the main shaft to work in, unless some special arrangement be made, when the ship is fully loaded with a general cargo, the fore-hold may contain so much more weight than the after-hold that the ship will be down by the head. On the other hand, if the engine space be placed further forward so as to equalise the cargo space in the holds, when unloaded the ship will be down by the head. These and many other technical difficulties puzzled the best brains in the shipbuilding world for some time. Another difficulty, in some instances amounting to a danger, occurs in the case of large cargo steamers capable of carrying a great amount of dead weight. The engine, boiler and bunker space amidships may contain comparatively much less weight than is in the ends of the ship. Moreover, as the coal is consumed from day to day, the bunkers become gradually emptied, and the ship may be seriously strained, the weight at the ends causing a sagging, an experience familiar to the officers of large cargo liners. The snapping off of rivet heads, the starting of iron deck seams, and other signs, reveal the existence of an unequal strain. Hence the many special systems of construction now available, and the need for the best and most experienced advice, and unremitting care when ships are designed, and whilst they are under construction. Moreover, when the ship is completed and ready for work, there is need for an experienced oversight on the part of owners and officers in order that the cargoes carried may be properly stowed, and the weight rightly distributed. In the case of a steamer trading to a number of ports, perhaps discharging and loading cargo at every stopping place, the need for care and attention, and the knowledge which can only be gained by experience, is considerably greater.

Why ships have developed the special forms with which one is so familiar is due to many reasons. At first a flush deck type would appear to be the most handy, but the steering apparatus at the stern needs protection, and so does the windlass and capstan at the bow, hence the flush deck steamers developed poop and forecastle, and as the engine casing amidships with the navigating bridge was found to suffer damage when a heavy sea swept the deck, there gradually evolved the amidships accommodation going right across the ship, presenting many conveniences, and proving a great element of strength and safety. Then the wells between the amidship bridge house and poop and forecastle were covered in, and according to the strength of the scantlings, the ship with a continuous upper deck is known as *shade-decked*, *spar-decked*, and *awning-decked*.

But competition with shipping is apt to be very keen, and dues are charged according to measurement, thus if by any contrivance the carrying capacity of a vessel can be enlarged, and the measurement on which dues are paid can be reduced, a great economy is effected. This has led to the construction of turret ships. One of the first of these rather curious looking vessels was the *Turret*, built at Sunderland in the year 1892. The great external feature of this type of vessel is that there are two external decks, the turret deck, a comparatively narrow deck running right fore and aft at a height of about ten feet above the water, and then the harbour deck, which runs along either side of the ship just above the water-line where the tumble-home commences which forms the turret. This method of construction leads to a considerable gain in strength, and at the same time gives great carrying capacity as compared with measurement.

Another type of steamer is that built on the cantilever principle. This type has been constructed for trades where either the outward or the homeward trip has to be made in ballast owing to lack of cargo. For instance, the United Kingdom takes very much more in bulk and weight from the United States than she sends there; the consequence is that some ships have to cross the Atlantic in ballast; the ordinary ballast tanks formed by the double bottom of a ship are not sufficient when crossing a stormy ocean. A steamer drawing but little water will in heavy weather run the risk of breaking her shaft or losing her propeller, owing to the propeller racing clear of the sea when the ship is pitching heavily. The cantilever principle of construction provides the extra ballast necessary for such voyages, this being stored in wing tanks which run right fore and aft on each side of the ship right under the main deck, and extending from the ship's side to the line of the hatch coamings. They thus form two great box-girders which add considerably to the ship's strength both transversely and longitudinally. So great is the additional strength that hold-pillars, beams and web frames are not needed, and thus the hold is perfectly clear for storage purposes. Very long and wide hatchways can be arranged for in vessels built on this principle; and as the tanks are not included in tonnage measurement, steamers can be built on this method which will carry three tons dead weight to every net register ton.

The following may be given as a typical cargo steamer of the most recent type, built during the year 1912: she measures 7760 tons gross, 4870 tons net, her length is 470 feet, with a beam of 54 feet, and a depth of hold of 31 feet. Her engines are quadruple expansion, her boilers work at a pressure of 220 lbs. Her crew, when she is carrying cargo only, numbers 43 for the deck and 34 for the engine room, that is 77 all told. If in addition to cargo she carries emigrants, 14 more able seamen are carried and 29 stewards, bringing the complement up to 120 all told. The cargo carrying capacity is 10,400 tons, the consumption of coal is 68 tons per day, and on an average she steams 4½ knots per ton of coal consumed, on a voyage of 25,000 knots. Her average sea-speed per hour is 13 knots.

It has been demonstrated that a steamer of this capacity only costs 20 per cent. more to run than a steamer having a capacity of but 5900 tons.[1]

[1] *Cf. Syren and Shipping*, Jan. 15th, 1913, p. 200.

Thus where the trade is sufficient in quantity and regularity, the larger the steamer, if economically designed in every particular, the better is the economic result.

CHAPTER XI

REFRIGERATING SHIPS

It was about thirty-five years ago that the possibility of bringing frozen meat to this country was first realised. In the year 1880 the first shipment from Australia, consisting of 400 carcases of mutton, was landed in London. Twenty years later the import of sheep and lambs had increased to over seven million carcases. Thus in the year 1901 Australia exported over 1,225,000, New Zealand 3,230,000, and Argentina 2,600,000, whilst by 1910, in addition to 13,000,000 carcases of sheep and lambs, over 4,000,000 carcases of beef were imported, and there are now considerably over 200 steamers with a carrying capacity of about 15,000,000 carcases engaged in the trade. Nor does this give an idea of the whole importance of the refrigerating ship. Cold storage enables steamers now to bring to the United Kingdom from far distant countries, including Australia and New Zealand, and North and South America, not only mutton, lamb and beef, but rabbits, butter, milk, fish, vegetables, fruit, sweetbreads and kidneys. In meat alone 20 lbs. per head of the whole population is imported every year.

The first important steamer engaged in the trade was the *Orient*, the flag-ship of the Orient Line. This was in the year 1881. But those were the early days of steam to Australasia. Sailing ships were still doing the main part of the carrying trade. Steamers were running with mails and passengers to Australia direct, but New Zealand was only just beginning to agitate for direct steam communication with Europe. Thus at the outset, as there were no available cargo steamers suitable for the trade, a number of sailing ships, the first of these being the *Dunedin* of the Shaw Savill and Albion Company, were insulated and fitted with refrigerating machinery, and for several years they continued to be utilised in the trade. Before a cargo of meat had been brought by a refrigerating vessel, it had been satisfactorily demonstrated by some theorists that the scheme was quite impracticable. An ounce of practice proved in this, as in so many other instances, worth many hundredweights of theory. Gradually a number of steamers had a portion of their cargo space insulated and the necessary machinery fitted on board to enable them to carry frozen carcases, and eventually the demand for the meat grew to such dimensions that steamers were specially designed and constructed for the trade.

From a comparatively small beginning, a big trade has developed under the two forms of freezing and chilling certain forms of perishable cargoes. In the case of chilling, the hold in which the cargo is stored is kept at a low uniform temperature, and thus such commodities as fruit, vegetables, and eggs can be transported long distances in good condition. In the case of refrigerating, the temperature in the insulated hold is kept well below freezing point. The possibility of carrying perishable food through tropical climates, and storing it for weeks and months before use, is the result of a combination of scientific research and commercial enterprise. The flocks and herds of Australasia and South America were growing enormously in number. The wool and the hides, horns, and skins could be profitably exported, but the meat, beyond the small amount required for consumption on the spot, could only be cooked and tinned, or made into extract. There was great waste of good food, but by the successful application of refrigeration to the storing and carriage of meat, not only could the carcases be utilised to better advantage, but by creating a growing demand for meat, the sheep and cattle-breeding industry received an all-round and far-reaching benefit. For when once the demand for meat became regular and progressive, there was no immediate limit to the extent to which these important industries might be developed. In other words, the externals, wool, leather, and horns had been the important products for the owners of sheep runs and cattle ranches; the meat was a by-product not always easy to deal with. With the advent of the refrigerating ship this changed; the meat became as important, if not more so, than the wool and skins. And the industrial millions of a busy manufacturing country have been provided with a substantial meat diet which would otherwise have been beyond their means.

So far as New Zealand is concerned, these possible advantages were realised by the settlers themselves, for it was they who formed the first freezing companies. The industry was in the experimental stage until the year 1881. In that year 17,000 carcases of mutton, together with a small quantity of beef, were landed in London from Australia. Of this, only about 6000 carcases arrived in good condition; of the remainder, one half was reported to be "*irregular in condition*" and the other to be "*unsatisfactory.*" The next year, however, New Zealand began to export, and of nearly 9000 carcases shipped to London, the whole arrived in good condition. The following year New Zealand exported no less than 120,000 carcases of mutton, and Australia successfully placed on the London market over 60,000 more. The success of the first shipment from Port Chalmers, New Zealand, led to important results, for freezing works commenced running almost at the same time at Auckland, Napier, Wellington, and Christchurch. Since then the trade has constantly increased.

The industry entails the provision of adequate slaughtering and freezing establishments by the supplying countries. These places are very completely equipped, and present innumerable points of interest. No part of the animals slaughtered is allowed to be wasted. The industry is thus typical of the best modern commercial organisation, under which waste is reduced to a minimum, with the maximum of advantage to the community. In addition to the slaughtering and freezing of the animals, cold storage has to be provided by both the exporting and importing country; while for the delivery of the carcases, insulated barges and trucks are necessary. Between the cold storage in the exporting and importing countries, the carcases are transported, as has been described, by specially constructed steamers, as to which there are many interesting features.

To insulate the cargo space of a steamer is a serious undertaking from several points of view. The method adopted is to line the ship's side with wooden boarding, leaving a space of about twelve inches width between the wood and the plating of the ship's side and deck. This space is filled up with either charcoal or silicate cotton, for the purpose of keeping the heat out and the cold in. Thus considerable cargo space is sacrificed, and if there be no meat available, and the vessel has to load other forms of cargo, there is a loss. Moreover, if wool be stored in an insulated hold, it is impossible to use *screws* for stowing purposes, for though by screwing the wool the quantity carried is increased, there is a danger of damaging the insulation; hence again there is a loss. It would be unwise, too, to carry heavy dead weight cargo, such as ore or rails, in an insulated hold, owing to the possibility of damaging the insulation.

With experience of the trade and its requirements, great improvements have been made both in the ship, and in the refrigerating engine; for instance, a few years ago an ordinary steamer, whose refrigerating machinery was operated with steam from the main boilers, would suffer a decrease in speed of about a knot an hour, whilst there would be an extra consumption of from 8 to 10 tons of coal a day. With modern machinery, however, the extra consumption of coal for the refrigerating machinery is but small, 2 or 3 tons a day, and the speed is scarcely affected. During the voyage the conditions as to the temperature of the air and sea make a difference to the cost of conveying frozen meat; for instance, if a steamer comes home round Cape Horn where the temperature of both air and sea is low, the refrigerating machinery would only need to be run four to six hours a day, whereas in the tropics twenty hours or more each day would be necessary.

The cost of preparation, transport and storage was very considerably decreased during the first ten or twelve years of the trade. Originally it cost at least ½d. per lb. to freeze the carcases for shipment. Within twelve years from the commencement of the industry this could be effected at a cost of three-eighths of a penny per lb. or even less. Indeed, by the year 1894 the total charges on mutton for slaughtering, freezing, freight, insurance, and the London charges, only averaged two pence per pound.

CHAPTER XII

TANK STEAMERS FOR THE TRANSPORT OF OIL IN BULK

IT has been said that the American Indians knew the value of rock oil, but until about sixty years ago it was a stranger to civilisation. Then someone in the States *struck oil*, and from that moment this commodity has enjoyed a growing importance, until at the present moment it is looming very largely in the public eye. The poor man's light, and frequently his fuel, the rich man's motor spirit, innumerable by-products utilised by the chemist, the confectioner, the engineer and the doctor, all these and many other utilities have resulted from researches into the nature and constituents of petroleum. As soon as it was discovered in sufficiently large quantities, the question of carriage became of importance. At first the forty-gallon barrel—the familiar paraffin cask—was the usual package for handling the oil in any quantity. But this was a cumbrous, and withal expensive, way to deal with a liquid required in millions of gallons. At the American oil fields the barrel gave place to the tank on wheels, and tank trains for a time became the rule. This, however entailed considerable expense, and it occurred to some long-headed oil magnate that if water could be supplied to towns through pipes, why not oil. This thought was quickly put into practice, until at the present moment, in connection with the oil fields of the world, there are many thousands of miles of pipe lines of varying capacity, and the tank trains have become almost obsolete. The demand for oil grew, and nations not favoured with a natural supply required large quantities from those to whom nature had been more kind in this respect. The barrel in the first instance was utilised for shipment purposes. But the shape of a barrel, convenient for rolling purposes ashore, was unsuitable for shipment. There was too much lost space, and in cases where the stowage was faulty, the barrel became a danger in heavy weather if it once "got a roll on it." In practice, between three and four of these forty-gallon barrels were equal to the ton measurement allowed on a sailing ship, namely 50 cubic feet. A ton weight of barrels full of petroleum occupied something like 80 cubic feet, or two tons of steamer measurement space. In other words it was soon evident, when a world demand resulted in large quantities of petroleum being shipped in barrels, that even including the gross weight, *i.e.* cask and oil, over one-third of a vessel's cargo space was wasted, and if merely the oil was taken into the calculation, a vessel was only carrying about one-half of the weight that she would be able to if oil could be carried in bulk, and packages could be dispensed with. This naturally set men thinking. First of all the square four-gallon tin case was introduced; this case in twos or fours packed in wooden cases effected an economy in stowage, and case oil became a familiar object all over the world. Old tin cases have been put to multifarious uses, indeed their utility to a backwoodsman can hardly be realised by the town dweller. Thus the case is popular, and the transport of oil in cases is likely to be permanent for many purposes. In the early days of the present year, 1913, there were ninety steamers measuring about 480,000 tons on the stocks, being specially constructed for the carriage of oil, and although the majority of these were tank steamers, several were of a special design for the transport of oil in cases. One of these steamers is over 313 feet in length, and is designed to carry over 90,000 of these cases.

But barrels or cases require much handling either to load or unload for ocean transport purposes. Thus it was soon realised that where oil is required in bulk, or where facilities exist for storing in bulk and filling into casks or cases for local consumption, a very great economy in handling can be effected by pumping the oil into a ship's hold, and on the arrival of the ship at her destination, the pump will carry through the work of discharging much more quickly than a crane or a winch slinging cases or casks. In practice it was found that 1700 tons of oil in bulk can be pumped into or discharged from a tank steamer in about six hours, whereas to discharge the same vessel loaded with 10,000 barrels would require at least four days. As a result of the immense volume of the oil trade to-day, it is possible not only to construct large steamers to carry the oil in bulk, but there are depôts covering a large area having facilities specially developed for the handling and storage of oil, in the shape of wharves, tanks, and pipes of various descriptions. A typical oil depôt of this kind has been constructed at Thameshaven.

This all reads quite simply, but to attain the present perfection of organisation has required long years of experiment, and many a failure. The carriage of oil in bulk at sea presents to the shipbuilder many a knotty problem. On a sea voyage variations of temperature of from 40 to 60 degrees Fahrenheit are a very usual experience. But mineral oil is very considerably affected by temperature, a rise of 20 degrees Fahrenheit will cause an expansion in bulk of about 1 per cent. Thus if tank ships be fully loaded and the tanks sealed, and then the ships pass into a higher temperature, it may cause sufficient expansion to burst the tanks, or conversely if the ship enter a lower temperature, there may be created a space, which in bad weather, if precautions have not been taken to meet the emergency, may cause danger or disaster through the oil becoming violently agitated by the rolling and tossing of the vessel.

Another difficulty in carrying oil in bulk is to avoid contact with lights or fires. In a sailing ship this is merely a matter of care, but in the case of a steamer the furnaces present a very special problem. The usual method is to place the engines and boilers in the after end of the vessel, and construct a double bulkhead between the boiler space and the hold, thus there is a clear space, leakage into which can at once be dealt with.

Petroleum is even more penetrating than water, any vessel to contain it without leaking or weeping must be exceedingly well constructed, thus tank steamers have to be as carefully rivetted and caulked as steam boilers.

The carriage of oil in bulk has now become so great a business, and its development promises to be so considerable in the near future that a short history of the trade will not be out of place. The first case on record of a ship carrying oil as cargo in a tank occurred just half a century ago, and the ship flew the British flag. This, however, led to no important result. The next step was taken by a German shipowner, Herr Riedemann of Geestemunde. He had some wooden ships that had been constructed for the Far Eastern trade, which were fitted with iron tanks sufficiently large to contain the water supply for a long voyage. These ships were diverted from the Eastern to the Atlantic trade. The water necessary for the shorter voyage could be carried in wooden casks, and the iron tanks were utilised for the carriage of oil in bulk. The experiment was so successful that the same shipowner had a large composite built ship, the *Andromeda*, of 1876 tons, fitted with square iron tanks on three decks, and to still further economise handling expenses he arranged a system of pipes and pumps so that these tanks could be emptied and filled mechanically. The experiment succeeded so well that Herr Riedemann decided to build a tank steamer. There was a certain amount of opposition to this, not only on account of the supposed danger of carrying oil in bulk, but because brokers feared a diminution in their commission, and other interests connected with the loading and discharging felt that the field for their services would be curtailed. The first specially constructed tank steamer was the *Gluckauf*, built at Newcastle-on-Tyne in the year 1886. This vessel measured 2300 tons gross, had triple expansion engines, and was fitted with electric light throughout, in order to minimise the use of naked lights. A coffer-dam separated her boilers from the holds, and the latter would contain about 2600 tons of oil. This steamer made her first voyage across the Atlantic towards the end of the year 1886. About twelve months previous to this an ordinary cargo steamer, named the *Marquis Scicluna*, measuring 1655 tons gross, had been purchased from her original owners by a South Shields Company to be converted into a tank steamer. Her hatches were plated over, only manholes and pipes for filling and emptying purposes communicating with the holds. The ship was fitted with electric light, had coffer-dams between the engine and boiler space and the holds, and was in all respects a tanker. This vessel was undoubtedly the first tank steamer trading to Western Europe; she was in the Russian trade, and for the most part traded between Batoum and Trieste, but occasionally brought a cargo of oil to London or Antwerp. It is possible that steamers were employed carrying oil in bulk both in American and Russian waters before this, but these are the earliest examples of the tanker owned in England or Germany.

About six years later (1892) two serious explosions took place in vessels of this type, and as the number of ships carrying oil in bulk was increasing, the Board of Trade held an inquiry which elicited several interesting points as to the possible dangers of this method for carrying oil. Gases are generated which cling about confined places, especially under decks where there is no ventilation, and even a considerable time after the ship has discharged her cargo, a naked light may cause a serious explosion or fire. Such occurrences do in fact happen with other cargoes, but as oil generates very volatile gases, it is more than ordinarily dangerous. The economy effected by carrying oil in bulk was so great that it was worth incurring some risks, especially when the full extent of the risk was ascertained, and safeguards could be adopted. Within three years of the construction of the first tank steamer, more than half the oil imported into this country came in bulk. Nor will this be wondered at, since it was calculated that the saving effected amounted to something like four shillings per barrel, or nea ly 1¼d. a gallon.

For several years the Suez Canal Company refused to allow steamers carrying oil in bulk to use their waterway, but in the year 1902 this rule was relaxed, though the regulations as to tank steamers were rather unnecessarily stringent; from the year 1907, however, this stringency has been very much modified.

The year that the Canal was opened to tank steamers there were no fewer than 200 of them registered at Lloyds. The finest of them was the *Narragansett*, a vessel of the shelter deck type, over 500 feet long, with a capacity for carrying 11,000 tons of oil in bulk. This fine vessel has a speed of 14 knots; her furnaces are fitted to consume either coal or oil. She has no fewer than twenty-seven water-tight bulkheads, and the oil is carried in twenty tanks. Her engines and boilers are placed amidships, thus eight of the tanks are forward of the engine space, and eight abaft. The other tanks are on the main deck. A special pumping installation can discharge a full cargo in twelve hours. By a strange change in shipping customs, but which is now becoming an ordinary practice, the sailors and firemen are housed at the after end of the ship, the officers and a few passengers are accommodated amidships. The construction of this vessel marked a great advance in the business of carrying oil in bulk.

One of the large companies in the mineral oil trade has a fleet of sixty-four steamers, measuring over 185,000 tons, and having a carrying capacity of over 200,000 tons of oil in bulk and nearly 500,000 cases of oil. The present high price of oil and petrol is due partly to the effects of combination, but it should be remembered that the demand for oil has grown so rapidly that there has been a difficulty in building tonnage quickly enough to meet it. New companies have been organised, and the type of steamer designed for the trade tends to increase in capacity, and hence in economy. Eventually the trade will become normal and regular, and then prices may be expected to return to the old level. Meantime there is a growing demand for tank steamers. One of the new companies that has been established has a capital of £3,000,000 sterling. This company ordered no less than nineteen tank steamers, the largest having a capacity of over 15,000 tons each; the entire capacity being a quarter of a million tons.

One of this fleet, the *San Fraterno*, is over 540 feet long, and has a beam of 66 feet 6 inches. Her speed is less than that of the *Narragansett*, being only 11½ knots per hour. The machinery is placed at the end of the ship and the boilers burn oil fuel.

According to Lloyd's register, in the year 1911 there were 48 sailing ships and 234 steamers carrying oil in bulk; in the year 1912 there were 50 sailing ships and 258 steamers. Whilst towards the end of the same year there was another 480,000 tons being constructed. Some of the sailing vessels are of novel construction and equipment. For instance, there is one named the *Navahoe* belonging to the Anglo-American Oil Company; she has six masts with a fore and aft rig, is installed with wireless telegraphy, can carry a cargo of 12,000 tons of oil in bulk, and can either sail under her own canvas, or is sometimes towed by a steamer belonging to the same Company. There is a great future before the tank vessel, for when oil finally takes the place of coal, instead of the thousands of colliers which are so familiar a sight at sea, there will be an equal, or greater number of tankers, and coal dust, smoke, and ashes will become a part of past history, and as out-of-date as the paddle engine for Transatlantic voyages.

CHAPTER XIII

THE DEVELOPMENT OF THE MARINE ENGINE

This sketch of the development of the marine engine is merely historical; it makes no pretence of giving a technical description of scientific and engineering facts, nor does it enter into discussions in which engineers alone are competent to take part. It has already been told how the single-acting low-pressure marine engine could never have been utilised for the transport of cargo under modern conditions, the main reason being the excessive consumption of coal. In the case of an engine working at 6 or 7 lbs. pressure, the coal consumption was about 10 lbs. per horse-power per hour. The Cunard steamer *Mauretania*, with 70,000 horse-power, would have had the enormous consumption of over 300 tons of coal per hour, or 7500 tons per day, whereas her actual consumption averages about 1000 tons per day.

The early experiments on the Clyde with compound surface condensing engines showed that, working at a pressure of about 60 lbs. to the square inch, the consumption of coal was reduced from 6 or 7 lbs. per horse-power to 3½ lbs. Recent experience proves that with a working pressure of

200 lbs. to the square inch, coal consumption is reduced to about 1¼lbs. of coal per hour per horse-power.

During the past half century the marine steam engine has passed through several stages, each marking a further step towards perfection; and when it seemed as though perfection had well-nigh been reached, new types have been brought into the field which threaten to displace the reciprocating engine altogether. The compound engine enjoyed quite a long life, its economic success was realised in the late 'fifties, and for over twenty years it was without a rival. Then Dr Price invented the triple expansion engine, effecting further economies in the consumption of fuel; but even when the *Aberdeen*, the first steamer fitted with triple expansion engines, had proved the value of the new system, some steamship owners clung to the compound engine which had for so long given satisfactory results. Nor is this altogether to be wondered at, for in both passenger liners and cargo tramps the compound engine was working well. Three years after the success of the *Aberdeen*, the *Etruria* and the *Umbria* were built, and engined on the compound principle. The *New York* and the *Paris* were the first of the Atlantic liners to be fitted with triple expansion engines: this was in the year 1888. The pressure, too, at which the engines worked began to increase. In the year 1887 a pressure of 155 lbs. was reached. The engines of the *New York* and *Paris* worked at a pressure of 150 lbs., and gave a speed of

19 knots, their horse-power being 18,000, and the consumption of coal 328 tons per day. In the year 1893 the *Campania* and *Lucania* were fitted with triple expansion engines, and, at great comparative cost, attained the then record speed across the Atlantic of 22 knots an hour. These steamers consumed 1½ lbs. of coal per horse-power per hour, and their engines worked at a pressure of 165 lbs. to the square inch, and developed 30,000 i.h.p. In the year 1899 the *Oceanic* was fitted with triple expansion engines working at a pressure of 192 lbs., developing 29,000 i.h.p. and steaming 20 knots an hour.

About the year 1894, quadruple expansion marine engines were constructed, effecting a further economy, but rather less marked than that resulting in the case of the *Aberdeen*. In the year 1900 the *Ivernia*, measuring 14,000 tons gross, was fitted with engines constructed on this system, but she made no pretence to speed. With an i.h.p. of 10,400, and a working pressure of 210 lbs., her speed was only a little over 15 knots, and her consumption about 130 tons a day. As showing how speed affects the consumption of fuel, it may be mentioned that the German liner *Kaiser Wilhelm II.*, measuring 19,000 tons gross, whose i.h.p. is 45,000, and working pressure 225 lbs. to the square inch, with an average speed of 23½ knots, has an average consumption of nearly 700 tons of coal a day.

But in the year 1905 a new departure was made in the type of engine working the fast Atlantic mail steamers. The turbine or rotary system is one of the oldest forms of producing power. The possibility of harnessing the driving force of a stream, and making it drive machinery by means of a water wheel, has been known and practised for many centuries. It was Sir Charles A. Parsons who conceived the idea of substituting steam for water, and by means of enclosing it in a cylinder, to produce an engine which should be at the same time simpler, more economical to operate, and be more compact, and faster than the ordinary reciprocating engine. In its original form the marine turbine engine consisted of a shaft on to which was keyed a drum furnished with projecting blades; this drum was enclosed in a cylinder, the interior of which was fitted with fixed projecting guide-vanes. The steam was admitted into this cylinder, and as it struck and expanded against the blades, it caused the shaft to develop a rotary motion. This is the turbine engine in its most simple form. From this the inventor has, by a series of improvements and inventions, finally produced what is probably destined to be the last word in steam.

The first vessel to be fitted with a turbine engine was the *Turbinia*, a small craft of 100 feet long, resembling in model a torpedo boat. She was built on the Tyne in the year 1894. The highest speed this boat attained was 34 knots an hour between Spithead and Southampton Water. As a result of successful speed trials two torpedo boat destroyers—the *Viper* and the *Cobra*—were built, and attained the great speed of 36·5 knots an hour.

Then the Clyde passenger services took up the new method of propulsion, and two very successful river steamers—the *King Edward* and the *Queen Alexandra*—proved the superiority of the turbine over the reciprocating engine, both in speed, comfort and economy. The *King Edward* on a run to Campbeltown, a distance of eighty miles, averaged a speed of 19 knots, on a consumption of 18 tons of coal a day; and the builder stated that the results from this vessel showed a gain of 20 per cent. in horse-power in favour of the turbine engine. Then the cross channel services adopted the turbine with success, and to test the efficiency of the system on a route where heavy seas run, turbine engines were fitted to new steamers on the Isle of Man, and Irish services: this was in the year 1903.

The experience of the first two years of marine turbine engines enabled the inventor to prove that the greater the speed attained the greater is the economic advantage which the turbine engine has over the reciprocating type. At a speed of about 14 knots an hour the consumption of coal was nearly equal for both types of engine in similar craft; at a speed of 18 knots, however, there was a saving in coal of somewhere about twenty per cent., whilst at a speed of 20 knots the saving was no less than thirty per cent. Thus at first it did not appear that the turbine engine would effect much for slow-going cargo steamers. Recently, however, as will be seen, there has been an important development of the turbine system by the adoption of gearing, and the geared turbine has been fitted to tramp steamers with great advantage.

As the majority of readers will doubtless remember, when the twentieth century dawned, Germany held the blue ribbon for speed across the Atlantic. The *Deutschland*, built in the year 1900, had been fitted with probably the largest and most powerful marine reciprocating engines that could be constructed to work on commercial principles. This ship and the *Kaiser Wilhelm II.*, built in 1902, have an average speed of 23½ knots an hour. Wisely or unwisely, it was determined that the supremacy in speed should be regained by Great Britain; and the Cunard Company, with Government assistance, set about constructing two steamers which were to be of phenomenal dimensions and record-breaking speed. Many engineers shook their heads and prophesied failure, and presumably, but for the new type of engine, very great difficulty would have been encountered in producing a vessel capable of greater speed than the German *greyhounds*. A committee of experts advised that the proposed leviathans should be fitted with Parsons' turbine engines, and the Cunard Company decided to adopt the recommendation. The order for the *Lusitania* was placed on the Clyde, and that for the *Mauretania* on the Tyne. The success of these two fine vessels, which have now (1913) been running five years, is too well-known to need recapitulating. But it should be mentioned that to gain experience this same Company built the *Carmania* in the year 1905, and had her fitted with turbines. She was not the first turbine steamer, however, to cross the Atlantic. The first to accomplish this under turbine power were the Allan liners, *Victorian* and *Virginian*. The importance of the *Carmania* is that, owing to her success, the *Lusitania* and *Mauretania* were fitted with turbines, and the speed they attained, 26 knots an hour, has restored the supremacy for speed to the United Kingdom. The *Imperator*, the latest German liner, is a six-day boat, nor was she apparently ever intended to develop record-breaking speed.

The turbine engine has proved its superiority over either triple or quadruple expansion reciprocating engines for vessels where express speed was the main consideration; and in doing so demonstrated its greater economy both in first cost, in the space occupied by machinery, and in economy of working. This attracted the attention both of builders and owners of cargo steamers, but for a time it looked as though many difficulties would have to be surmounted before an engine suitable for slower, rougher vessels would be contrived. The inventor of the turbine, however, continued his efforts, and eventually invented a system of gearing which was so promising that he purchased a steamer named the *Vespasian*, and in the year 1910 took out the reciprocating engines, and installed the first engines constructed on the new model. Two years' experience with this ship has shown that there is economy in coal and oil consumption as compared with triple expansion engines, there is an absence of racing in rough weather, reduced wear and tear to the machinery, increased reliability of running in all weathers, reduced weight of engines, and increased cargo carrying capacity due to smaller coal consumption. This all-round saving, together with a diminished first cost, gives the geared turbine a great advantage over the older types of marine engines.

The *Vespasian* proved to be a success and was purchased by Messrs Noble & Co., the managers of the Cairn Line. They were so well satisfied with the experiment that they commissioned Messrs Doxford of Sunderland to build them a new steamer, which they christened the *Cairnross*. This vessel was the first cargo steamer to be specially built and engineered on the new principle. The *Cairnross* has a dead-weight capacity of 7800 tons, the length being 383 feet, beam 51 feet, and depth moulded 27¾ feet. The turbine engine runs at a speed of 1700 revolutions per minute, but is geared down so that the main shaft runs at a speed of only 65 revolutions. In the month of February 1913,[1] a test was arranged between two sister ships—the *Cairnross* and the *Cairngowan*, the latter having triple expansion engines. The test consisted of a non-stop run from the Bristol Channel to Brest and back. The ordinary engine-room staff was on duty in each ship. The weather was bad, but the ships kept together throughout the run. The result

[1] *Cf. The Shipping World*, Feb. 19, 1913, p. 220.

showed that whilst the *Cairnross* went easily, the *Cairngowan* was pressed to her limit; whilst there was a saving of fuel in the case of the geared turbine vessel of fifteen per cent. It is said that the owners of the *Cairnross* [1] decided on adopting the geared turbine engine after a careful consideration of results from that type of engine and internal combustion engines, and they have since expressed their complete satisfaction with the geared turbine.

For some time past new methods of propulsion have caused the marine engineer to be an even more prominent figure in the shipbuilding world than the naval architect. Nor does there seem any likelihood of this interesting period terminating just at present. The main types of engines [2] now affording a subject of the most absorbing interest to those engaged in shipping are: (i) reciprocating steam engines or steam turbines directly coupled to the propeller shaft; (ii) combination systems of reciprocating engines and turbines, in which high pressure steam is utilised economically in the cylinders of a reciprocating engine, and the low pressure exhaust steam is then passed into a turbine, which is the most economical way of using it; (iii) geared turbines, in which the turbine is run at a high economical speed, and the propeller shaft caused to rotate by means of reduction gearing at a much lower speed, which will give a high efficiency to the propeller; (iv) internal combustion engines.

[1] *Cf. The Shipping World*, Nov. 27, 1912, p. 458.
[2] *Cf. Ibid.*, Jan. 1, 1913, p. 19.

But the type of engine by no means exhausts this interesting subject. What fuel shall be used to raise steam? Here, too, during recent months a series of important experiments have taken place. Coal, with all its advantages, has many defects as a marine fuel. Oil is more easily handled, is cleaner, and lends itself to economy of storage, thus increasing cargo carrying capacity. It would appear from the course of events, that when a system for replenishing the stock of oil has been satisfactorily established throughout the world, and the world's oil resources are more available, so that a continuous and economical supply is assured, oil will replace coal very considerably. Just to mention one trial, at the beginning of the year 1913 the Canadian Pacific Company's steamers,[1] *Princess Victoria* and *Princess Charlotte*, showed the following results of a test as to the relative advantages of coal and oil:—

Princess Victoria.

Cost of one day's fuel running with:

(i) *Coal.*		(ii) *Oil.*	
100 tons of Coal @ $4·50 . .	$450·00	344·17 barrels Oil @ $90 . .	$314·25
9 Firemen @ $55 .	16·50	6 Firemen .	11·10
9 Trimmers @ $45	13·50	Food . .	2·52
Food, 18 men .	7·56		
	$487·56		$327·87

[1] *Cf. Syren and Shipping*, April 16, 1913, p. 62.

Princess Charlotte.

Cost of one day's fuel running with :

(i) *Coal.*		(ii) *Oil.*	
100 tons Coal @ $4·50 . .	$450·00	344·17 barrels Oil @ $90 . .	$314·25
13 Firemen @ $55	23·80	6 Firemen .	11·10
10 Trimmers @ $45	15·00	Food for 6 men .	2·52
Food for 23 men .	9·56		
	$498·36		$327·87

In the first instance there was a saving of $159·34, and in the second $170·47 on one day's steaming.

In the case of another steamer whose furnaces were altered to consume oil fuel instead of coal, it was found possible to reduce the necessary staff from 32 to 8. There are many other advantages connected with the use of oil for heating marine boilers. Bunker space is very considerably economised ; coal is a bulky commodity and difficult to handle at sea unless it is stowed conveniently, thus coal bunkers usually occupy a considerable portion of the midship section of a steamer ; oil can be carried in the ballast tanks, or tanks for its reception can be contrived in awkwardly situated parts of the ship, unsuitable for cargo carrying or other purposes. Thus great additional freight carrying capacity results. Then the average heating value of oil is considerably greater than that of coal—some authorities place this as high as from forty to fifty per cent. ; and since a ton of either form of fuel occupies very much the same space (one ton of coal varying in measurement from 42 to 50 cubic feet, and oil averaging about 45 cubic feet to the ton) there is a further saving of weight to be carried, and of bunker space, where oil is used instead of coal. It may be asked why, if all this be true, oil does not supersede coal as the marine fuel. There are several reasons. Coal at present holds the field because it is fairly evenly distributed over the earth's surface, and coaling stations at convenient intervals have been established on all trade routes, thus there is certainty of supply. Oil until quite recently has been obtained mainly from either America or Russia; it has been to some extent subject to commercial manipulation, a monopoly in oil being possible when the sources of supply are limited; this situation is likely to be modified. Every progressive country is now making inquiry into its fuel resources, and undoubtedly very considerable additions to the world's supply of oil will be made available within a reasonable time. The British Government has been a pioneer in this work, with the result that it appears likely that the oil resources of the Empire will prove to be quite satisfactory. Nor is the subject exhausted when the supply of oil in the fluid state is known, for oil can be distilled from a variety of commodities, and here the work of the mining specialist and chemist may be expected to produce great results. While coal will continue to be of very great importance to mankind, there seems little reason to doubt that in a future, perhaps not very far removed from the present, coal in its familiar form will not be met with far from the colliery. It will be the distillates and by-products that will be employed in commerce, in manufacture, and for domestic use. The world appears to be on the eve of a great advance in this direction. When sufficient supplies of oil at a reasonable price are available at fuel stations as conveniently situated for commerce as are our present coaling stations, it will not be very long before coal as a marine fuel will disappear.

At present, in addition to the inconvenience connected with the supply of oil for fuel, there is, so far at all events as naval ships are concerned, the serious disadvantage that some oil produces, when consumed, a dense smoke—this is a point that will require the attention of the scientist, and will doubtless be remedied.

Thus there is a battle going on between rival fuels, and it may be that when the issue is decided, fuel, as the term is generally understood, will no longer be required! For steam itself is on its trial, and at the very moment when the turbine has proved its superiority over the reciprocating engine as the motive power for mail and passenger steamers of large dimensions, and its cognate form, the geared turbine, is threatening to take the place of triple or quadruple engines for the cargo steamer, the internal combustion engine has been invented, and its marine form already promises great things.

British owners and builders have until recently had but little to do with the adoption and development of this new motive force. For the last ten years the advantages of the internal combustion engine have been well known in Russia. A vessel named the *Wandal*, with a carrying capacity of 800 tons, and driven by a Diesel engine, was employed in the Russian oil trade in the year 1903. The company owning the *Wandal* have now a fleet of over twenty vessels all fitted with Diesel engines, of a horse-power ranging from 200 to 1200. It seems strange indeed at a time so obviously transitional as the present in all that appertains to methods of marine propulsion, that English engineers, hitherto pioneers in almost every branch of marine work, were caught napping. A Diesel-engined vessel named the *Delo*, of 4000 tons measurement, has been run by another Russian company since the year 1908. To Great Britain, however, belongs the distinction of building the first internal combustion vessel to cross the Atlantic. This was the *Toiler*, which was built on the Tyne and crossed over to Halifax, N.S., and is now a wheat carrier on the Lakes. But it was only the hull which was built on the Tyne, the engines came from Stockholm!

The advantages of this description of engine for sea-going craft, provided that a reliable machine be produced, are obvious. No coal bunker space is required, the oil for driving the engine can be pumped into the ballast tanks; no firemen are needed, and hence there is a great saving in the wages and food bills; whilst as there are also no boilers, great additional cargo space is available, and there is a considerable saving in the initial cost of the vessel.

The internal combustion engine was the invention of a German, Dr Diesel. It was first, however, applied to the propulsion of water-borne craft by the French, and has only somewhat tardily been taken up by the British shipbuilder. It must, however, be admitted that when once the possibilities of the Diesel marine engine were realised, British engineers quickly concentrated their attention on it, and notable advances have been made during the past two years in this country.

At the present moment there are two marine engines on which the attention of the ship-owning community is focussed—the geared turbine and the internal combustion engine. Each offers certain advantages, but if once it be proved that an internal combustion engine can be turned out capable of withstanding the severe tests of ocean voyaging, and the necessary oil be obtainable at conveniently situated stations at an economical price (and the accomplishment of both these would appear to be but a question of time), the advantages of this system are so great that the disappearance of the marine boiler may be looked for; either gas, electricity or oil being possible solutions of the problem of marine propulsion.

The motor is as yet in its infancy, nor can one predict what the next few years may bring forth. But with the number of highly skilled brains now at work, and taking into consideration the immense advances made in a comparatively short time, it would not be surprising were the maximum of efficiency at a minimum of initial cost, running expense, and space, realised within the next few years.

For years Dr Diesel had the ordinary experience of the pioneer. Engineers ridiculed his projects, deeming it impossible that anything could supersede steam or electricity. However the inventor persevered, and although the first engine built to his designs in the year 1893 was a failure, three years later German engineers produced a successful machine. The following year (1897) a Glasgow firm constructed an engine on Dr Diesel's method, and this is still working successfully. Then a small engine was constructed at Paris and fitted to a barge, *Le Petit Pierre*, running on the Rhine-Marne Canal. This was in the year 1903. In 1904 the first motor-driven craft was built in England for service on the Leeds and Liverpool Canal. The Russians, however, were the first to apply the system to commercial vessels of any size, as has already been described. On this side of Europe, Sweden showed the greatest interest in the new marine engine, and many engines for vessels built in this and other countries have been constructed by the Aktiebolaget Diesels Motorer of Stockholm. But most of the prominent British shipbuilders have now realised the value of the new motive power and have acquired rights to construct internal combustion engines, many new types and developments of which are now on the market.

The success of motor-driven vessels like the *Selandia* and the *Jutlandia* is well known; the following table taken from the *Shipping World* of January 1st, 1913, gives a very graphic idea of the advantages to be obtained from internal combustion engines :—

	Eavestone. (Motor Ship.)	*Saltburn.* (Steamship.)
Length (b.p.) . .	270 ft.	270 ft.
Beam . . .	40 ft. 6 ins.	40 ft. 6 ins.
Depth . . .	20 ,, 6 ,,	20 ,, 6 ,,
Draught . . .	17 ,, 11¼ ,,	17 ,, 11¼ ,,
Total Dead-weight .	3100 tons	3080 tons
Displacement (loaded)	4360 ,,	4360 ,,
Average speed loaded at sea . . .	9·08 knots	8·05 knots
Average consumption of fuel . . .	3 tons 13 cwts. (oil)	12 tons 15 cwts. (coal)

These figures tell their own tale.

The story of the development of the ship has now been told in outline. The advance made during the past century is a matter of legitimate pride to all those who have been connected with the great results attained.

From the 700 ton Free Trader to the 5000 ton Sailing Ship still employed in the corn and nitrate trades; from the *Comet* to the *Kaiser Wilhelm II.*; from the *Turbinia* to the *Aquitania*; or from *Le Petit Pierre* to the *Eavestone*; each system of propulsion has seen a development which has worked and is continuing to effect a peaceful yet far-reaching revolution, political, commercial, and social. The standard of skill necessary either to build or work the ship has been enormously raised; the type of man employed in all grades has been improved in the process almost beyond recognition; in a word, the highest results of a healthy civilisation are being enjoyed in increasing measure by those who do business in the great waters. The hardships and the hardness connected with the working of a ship have been mitigated to so great an extent that labour, tending unhappily to be degraded by heavy unremitting toil, is within measurable distance of being superseded. For each mechanical invention has seen the lot of the labourer improved. Were this the only result it would be ample, but it is merely one part of what has been effected, as will be seen when the remainder of the story of shipping is unfolded.

BOOK II

THE OWNERSHIP, MANAGEMENT, AND REGULATION OF SHIPPING

CHAPTER I

OWNERSHIP, AND THE MODIFICATIONS CAUSED BY MODERN FACILITIES FOR COMMUNICATION

Ownership usually has an attraction and always carries with it responsibility. Ship-owning, whilst it is more than usually full of interest, involves a responsibility greater than that attaching to any other form of property. The economist says that the user of capital should be a very special type of man, capital being such a delicate instrument that only those who have special qualifications ought to utilise it. The great danger connected with the handling of capital is that it is consumed in the using, and thus the wealth applied to the production of further wealth has first of all itself to be replaced, and then an additional amount must be created to compensate the lender of the original capital, and to pay the organiser for his trouble. Capital employed on shore makes great demands on the user's abilities, but where it is sunk in a factory and machinery, or consumed in payment of wages and the purchase of raw materials of industry, there always remains something tangible. The risk is appreciable, but given a good business man working under normal conditions, the capital is safe enough. When, however, the capital is employed to construct an ocean-going vessel, the risks are considerably increased, and the managing owner requires a greater number of qualifications, in order to cope with the numerous uncertainties of the shipping industry, than the employer or organiser in probably any other trade.

At present, and for some time past, shipping has been divided into two great classes—the liner running passengers, mails and cargo; and the tramp, a ship usually fitted to go anywhere and do anything, or at least capable of picking up freight at a large number of widely scattered ports. The management of these two types of ship requires different qualifications, but in either case the demands made upon the manager are arduous and many. The great underlying principle in shipping business is the observance, by all parties, of good faith. Without this success is impossible. Hence the first great qualification required by a managing owner is a knowledge of men, an unerring judgment, and a genius for selecting the right man for a given position. There is much about shipping that necessitates an autocratic government, and yet this same industry may be used as an admirable illustration of the benefit to be obtained from a healthy collectivism. There can be but one head to a shipping undertaking. But while the autocrat is responsible for the general business policy, and, it may be, is in personal touch with the main ramifications of the business, he must be prepared to a very much greater degree than his *confrère* who organises a business of any dimensions on shore, to delegate his power to officers and agents on whose acts and decisions so much may depend. Even to-day, with submarine cables and wireless telegraphy, this remains to a great extent true; before these aids to communication were available, the officer or agent on the spot had a far greater responsibility and influence over the success or non-success of the undertaking. Not only must a managing owner be a judge of men, he must be ever on the alert to note new developments connected both with the type of ship he is employing, and with all the conditions and circumstances of the trade in which he is taking part. For in no other calling is it so true that the capable man, who utilises a new method first, is the man who will get the greatest benefit from it. When a shipping firm begins to fall behind in the race, the result is usually fatal. There is no neutral state in this sphere, a shipping firm either progresses or degenerates; the former may be a slow process, the latter is apt to be rapid.

The ship-owner, too, must be an all-round man. Even though he be connected with one well-established trade, the very nature of shipping demands the best from a man who can take a very broad survey of the business world; and if his ships be engaged in tramping, his knowledge should be encyclopædic, and his experience world-wide. It is worth while making a comparison from this point of view between a manufacturer of some one commodity, whose market for raw material is limited, whose manufacturing processes are fairly easily learnt, and whose selling market may be restricted to the factor; and the manager of a line of tramp steamers, who is keenly interested in his business, and determined to be in the front rank. This man must, when making his plans, take a comprehensive view of the whole trading world, he must be on familiar terms with the commercial conditions of every commercial country, he must keep his eye on the crops, so as to know where there is a plethora and where there is likely to be a scarcity. But he requires beside this, the qualifications already enumerated, and in addition he must know the very latest points about steam, fuel, shipbuilding developments, and be master of a hundred and one other things, or his company will suffer.

To understand the present position of British shipping it is necessary to go back about two and a half or three centuries. In the early days of the seventeenth century Amsterdam was the great emporium of world trade, and Dutch shipping was to be met with wherever a cargo was to be picked up. But the English, too, were pushing out into new countries and new trades, and although at one time they were little better than pirates, the English ship-owner and sailor were beginning to compete for the legitimate trade of the world. England, also, had obtained a footing in the New World, whence large and increasing quantities of raw materials were being exported. English possessions, too, were increasing both in wealth and population. Thus towards the middle of the seventeenth century English traders and politicians felt that if possible the Dutch must be prevented from encroaching on this growing trade, at any rate with places belonging to England, where the trade had been established and developed by Englishmen, and was already giving promise of increasing demands on English shipping.

The English Government therefore determined to try the effect of a little restrictive legislation, and to this end passed the first Navigation Act in the year 1646. This enacted that no one in any of the ports of the Plantations of Virginia, Bermuda, Barbadoes, and other places in America, shall suffer any goods of the manufacture or growth of the Plantations to be carried away to foreign ports except in English ships.

English ship-owners, finding that this piece of legislation gave them increased and more remunerative employment for their ships, began to thirst for a little more restriction. Within a few years a further Act was passed which prohibited any foreign ship from trading with the American Plantations (*i.e.* Colonies), unless she was furnished with a licence; and a few months later, in October 1651, Cromwell's full policy came into operation with the passing of his great Navigation Act. This Act was not restricted in its operation to English possessions in America, for it declared that no goods or commodities whatever, of the growth, production or manufacture of Asia, Africa, or America should be imported into England, Ireland, or the English Plantations except in British built ships, owned by British subjects, and of which the Captain, and not less than seventy-five per cent. of the crew, were British subjects. This was neither more nor less than a big bid for the carrying trade of the whole world, Europe excepted, and both the direct and indirect effects were most momentous. To summarise briefly the more immediate results, one finds that the Dutch at once began to realise that trading possibilities were being restricted, and as their representations to the English Government were ineffective, war broke out. When Charles the Second was restored to the throne, Cromwell's shipping legislation was confirmed, and there was another war with Holland. In this, although the Dutch proved themselves good fighters, and did much damage both to the English coasts and shipping, the net result of the two struggles was that the resources of Holland were very severely strained, Dutch shipping was considerably cut up, and the English maintained their policy of restriction. Whether it was the effect of the Navigation Law, or of exhaustion following the struggle, the outcome was that Dutch shipping interests were crippled to such an extent that London took the place of Amsterdam as the great emporium for the trade of the world, and English shipping increased enormously on every sea.

These ships either belonged to the Chartered Companies, of which the East India Company was the greatest and most typical, or else were privately owned, either by individual ship-owners, or by a small partnership. But trading conditions both in the Far East and in the new countries being developed mainly by British energy, were then, and during a period which reached well into the nineteenth century, very different from those existing at present. There was but little regular or systematised trade; there might be some fairly regular import and export business carried on in connection with a few important commodities, but the trade was for the main part carried on by a system of ventures. A ship and her cargo represented a venture. There might be several owners of the ship, and many owners of the cargo, but the venture was organised as a rule to make the best profit possible according to the conditions obtaining at the terminal port or ports on the arrival of the ship. Thus an official, whose duties were by no means light, was carried by almost every ship. He was called the Supercargo: the very name to a great extent explains his duties. He was a business man versed in commercial procedure, capable of attending to the business of the ship when in port; thus he would supervise the handing over of the outward cargo to the consignees, or even arrange sales at ports, where this could be affected to advantage, of goods shipped as a venture, and so having no regular consignees. When the outward cargo was disposed of, or handed over, it was the Supercargo's business to make the best arrangement possible for the homeward voyage, either by purchasing cargo at owner's account, or by making freight arrangements with traders who had goods ready for export. Half a century ago even, when a ship sailed on a long voyage, it might happen that but little was heard of her until her return. There was no submarine cable by means of which an owner could control a ship's movements, as can be done to-day. Moreover, in the early days of the last century not only was there no direct control, but commercial methods, in out-of-the-way parts of the world, were by no means highly systematised. Our colonial possessions were new and practically undeveloped countries, the settlers were either grouped in small communities, destined in time to become important towns and cities, or were scattered over the country. The needs of the settlers were served by the general Store. Under such conditions a regular business system with agencies and organised methods was not to be expected. The Captain of a ship, or the Supercargo (in some cases the Captain held both positions; indeed it is said of Mr Duncan Dunbar, a well-known London ship-owner of the middle of last century, that he trained his captains so well in business methods that they were supercargoes as well as captains), held a position of great importance in the commercial world. The success or failure of the venture depended almost entirely on the ability of those who were responsible for the business of the ship at the terminal ports. The ship-owner could lay down the general policy to be followed, but the man on the spot had to act, and his decisions were vital. The laying of the submarine cable, and the development of the small communities of settlers into definite States or Dominions having as their shipping ports towns of growing importance, replete with every modern business facility; the appointment of definite agents on the spot, or the establishment of a branch house at the terminal port, very considerably modified the position of the Captain, and obviated the necessity for carrying a Supercargo. As India, and then China and Japan, were opened up to the casual trader, it became profitable business for the great merchant houses to have branches at the various shipping ports. Ships were consigned to these branches, and business in the Far East, as in America and Australasia, gradually developed along the lines which have resulted in the organisation of the present day. The Venture System tended more and more to become a thing of the past, both the import and export trade became regularised, and worked along well-established lines, some of the chief uncertainties began to disappear, and regular freights, fixed commissions, organised markets with brokers and definite methods, evolved. Hence there came about a very revolutionary change in shipping business, not caused by any sudden upheaval, but evolving with the progress of civilisation and commerce. When this began, and when it crystallised, it would be difficult to determine: the old shaded off into the new, the change was gradual. Perhaps the most definite line of demarcation between the old and the new may be said to be the laying of the submarine cable to all parts of the world; but this cannot be stated definitely, as it was but one of the many contributory causes. The latter half of the nineteenth century was, roughly speaking, the period during which the great change took place.

CHAPTER II

OWNERSHIP, AND THE MODIFICATIONS CAUSED BY THE MODERN TENDENCY TO COMBINE

One of the most striking of the phenomena of modern business life is the tendency towards abnormal size in individual businesses. In its most developed form the phenomenon is seen in the Trust or Combine, but it affects much smaller interests; indeed the tendency permeates the whole business world. For instance, during the past three-quarters of a century the banking business of this country has increased enormously, as can be seen by consulting the returns of the Banker's Clearing House, but the number of individual banking firms has very considerably diminished. There were in the year 1849 ninety-nine Joint Stock Banking Companies in England and Wales; in the year 1892 the number had grown to one hundred and two; six years later, however, there were only fifty-three; and this year (1913) the number of separate Banking Companies has been reduced to forty-three; and yet the banking business carried on now is infinitely greater than it was at any previous period. This tendency for big firms to become bigger, and for both big and small to amalgamate, has worked with marked effect among shipping companies. If one refers back to the first half of last century, the shipping of this country will be found to belong, for the most part, to comparatively small firms. There were, it is true, the regular lines of both sailing and steam vessels. Some of these were wealthy private firms trading on their own capital, and up to a certain point their importance went on developing. Then for such firms came the parting of the ways. The invention of the compound engine made it evident to the far-seeing ship-owner that the steamer must in the end displace the sailing ship as the cargo carrier of the world. Certain old established firms began experimenting with steam, although, at the same time they kept their fleets of sailing ships thoroughly up-to-date. As time went on and steam unequivocally asserted its superiority, these firms parted with their sailing vessels, and their fleets began to consist entirely of steamships. Nor were they satisfied with merely "going into steam," to use the current phrase, they continued their policy by always employing the most up-to-date steamer.

There was another development, too, not so visible to the superficial observer, but marking out the firm that was destined to continue its existence. New methods of trading, applicable to most businesses, came into vogue about the middle of the century. The Limited Liability Act, 1862, although it administered somewhat of a shock to old-fashioned business people, was really destined to give English trade an immense impetus, and a renewed lease of life and activity. When the capital available for the development of a business was restricted to the amount belonging to one man, however wealthy, or even to a small partnership of wealthy men, the business must be somewhat limited in its scope. If, however, capital be forthcoming in sufficient amounts, the limits that can be placed to commercial enterprise are enormously widened. There are not enough wealthy men keenly interested in business to undertake the great enterprises of the world, there would not be enough of them to carry on British shipping. If, however, the capable manager can be supplied with the capital that he is qualified to handle with advantage, sufficient capable managers to carry on a very great amount of business will soon be forthcoming. The secret of supplying the capable business man with sufficient capital to carry on business on modern lines is bound up with the principle of limited liability, under which any one who has saved a few pounds can invest them in commercial undertakings. If careful selection be made when investing, there will be a greater return than the market rate of interest, whilst even in the event of making a mistake, the investor's liability is limited to the nominal amount of his shares.

Shipping firms grew to a point at which it was practically impossible for any one man to finance them from his own resources. The progressive firms, including many of those just referred to, not only made use of the most up-to-date type of ship, but adopted the new method of trading, and became Limited Liability Companies. This enabled them to obtain the amount of capital which they could prove to the investing public, by their balance sheets and dividends, they were able to operate to advantage.

Looking back over the past half-century, it will be seen that the shipping firms which obstinately adhered to old methods, and refused to believe that the days of the sailing ship were ended, have one after another ceased to exist. The members of some of these firms were sufficiently wealthy to retire from business; others, whose names had been held in high repute in commercial circles, had a less satisfactory ending. But the small, or comparatively small, ship-owner is not a thing of the past, he still flourishes, and it is in the best interests of the country that he should. He is for the most part a new man, struggling to enter into shipping circles, and it is the advent of men like this that keeps shipping in a healthy state. Nowhere has competition during the last half-century been less restricted than in shipping business, and it is the keenness of the competition that has been a main cause of the great development both of ship and business.

Tracing out the development of ship-owning rather more in detail, it appears that at the commencement of last century British shipping, on the one hand, belonged to Chartered Companies having special trading privileges with certain countries. Thus the trade was to a certain extent regularised, and these ships may be looked upon as foreshadowing the modern liners. On the other hand there were numerous ships known under the general name of Free Trader, that is, they were able to trade with any country where the trade was not restricted. Free Trader ships were either owned by a capitalist firm, or by a small partnership.

When the great trade routes were thrown open, the change naturally made its effects felt among ship-owners. Lines of fine sailing ships belonging to private firms began trading regularly to India and the Far East, and eventually, as Australia was developed, they still further extended the sphere of their operations. Thus by about the decade 1840 to 1850, liners were owned by either chartered companies or by private firms. There still remained, however, a class of ship descended from the old Free Traders, owned either by a capitalist or by a small partnership. And this ship was by law divided into sixty-four parts, of which, so long as there were no subdivisions, the sixty-fourths might be registered in the names of any number of people from one to sixty-four. Partnerships like this were in many instances not only successful in their immediate operations, but enjoyed a consequent growth, which, as time went on, has enabled them to increase still further their importance under Limited Liability conditions, and in some cases develop into regular lines of the first rank. But the chief survival of the old Free Trader is the modern tramp steamer. The capitalist firms who resisted modern methods of conducting business, notably those who insisted on trading entirely with their own capital, have almost all of them ceased to exist. The subjoined diagram roughly shows the evolution, so far as management is concerned, of the modern liner and the modern tramp. It is of interest from several points of view, but especially as it shows that it is apparently the ambition of every small ship-owner to develop his business into a Liner Company. That is the effect of success and growth, and accounts for the fact that with greater and more regular trade, the Liner Companies tend to increase in importance, while the tramp continues to exist, but its sphere becomes increasingly restricted. Some of the types of ownership on the diagram opposite require a little further explanation. Beginning with the less important, before sketching out the evolution of the larger interests in British shipping, it will not be out of place to refer to the somewhat humbler, but equally useful, interests of which, while some have ceased to exist, others have developed into bigger things. The comparatively small shipping firms of half a century ago played a conspicuous part in our commercial development, and, at the time, made a deep impression on the trading world. Some of these firms began with one small ship, through whose success other ships were built; and these under capitalist ownership

SHIP-OWNERS.

1800.	Chartered Companies.	Free Traders. (Capitalist firms or a partnership.) } 1800
1840 to 1850.	Liners.	Useful cargo ships owned by capitalist firms or a partnership. (Usually divided into eighths.) } 1840 to 1850
1880.	Liners.	The Sailing Ship Firm or Company, to about 1895 important, now fast disappearing. — The Sixty-Fourther (steamer). } 1880
1913.	The modern Liner. — Mail and Passenger Liners. — Regular Cargo Liners. — Tankers.	The modern Cargo Tramp, tending to diminish in importance, though still estimated to represent about 60 per cent. of the world's total tonnage. } 1913

(New companies, it is needless to say, have from time to time been founded for a special purpose, and new men have commenced ship-owning, but the above description gives some of the main lines along which shipping management has evolved.)

were in the hands of one, or perhaps two, principals. Beyond the limitations of liability secured to them under the Merchant Shipping Acts, and the possibility of insuring, of which some of them were too proud to avail themselves, these men staked their own capital and ran their own risks. In less than a couple of generations such firms, in more instances than one, built up a fleet of sometimes ten to twenty fine useful ships, which in their day made handsome profits. The ship-owning families thus created have left their mark even where they have severed their connection with the sea. As a rule they took a great pride in the ships flying their flag, and what was even more to the point, they took a personal interest in their officers and apprentices. Some of the ablest officers of the older generation now afloat owe their training and position to a system that has played its part. The ships thus owned followed and improved upon the methods of the old Free Trader ships, and indeed are the links between them and the modern tramp. They traded wherever a cargo was to be obtained, and money to be earned; they opened up new trades, helped to develop new routes, and by the very handiness of their size, were able to accomplish what more ambitious ships would have failed to do. It was thus that many of the clippers were owned and managed.

There was, too, another type of ownership which in a way kept up the tradition of the adventurers. By British law a ship was, as has been seen, supposed to consist of sixty-four shares. At a time when a fine clipper could be built for fifteen to twenty thousand pounds, it was a fairly common practice for people having business relations, to arrange for the building of a ship to be managed by the one who had most experience of freight and shipping business generally. The others, in addition to their share of the profits made by the ship, would, if in a business connected with the repair or equipment of shipping, do that part of the ship's business for which they were competent. There was in this, when well carried out, a spirit of healthy co-operation. The managing owner conducted the main business of the ship, had his office, charged his expenses, and commission. The shareholders, in number they were a submultiple of sixty-four, usually four or eight, benefitted in their own special business by working for or supplying the ship, and in this way a big business might be developed, interest in one direction bringing business from another. Thus of the total result, the amount of profit made by the ship or ships might be of secondary importance.

The sixty-fourther became an established fact of some importance, and when the cargo steamer became an economic reality, large numbers were built and owned on this system. In many respects the system worked admirably, though there were abuses, from time to time, as in everything human. There were cases in which slim managing owners allotted more than sixty-four sixty-fourths in one steamer, or attempted to get an undue profit out of management. Their attempts, however, speedily worked their own cure. Capable and honest management, in some cases, brought not only prosperity, but the enlargement of the business into that of an important steamship company. The sixty-fourther still exists, but for the most part now even a single steamer is the subject of a limited liability company, the capital being divided into shares of a small amount, in order to induce the smallest investors to participate in shipping business. The holder of an eighth, sixteenth, or even sixty-fourth, in a modern cargo steamer needs to be a fairly substantial man. The modern method is to attract capital even in comparatively small amounts; there is less trouble and friction with the shareholders, but, more important still, the lowering of the denomination of the share opens up a very largely increased possibility of capital.

Turning from the tramp to the liner, the principal mail and passenger lines were founded as Chartered Companies about the time of the accession of Queen Victoria. For instance the Peninsular & Oriental Steam Navigation Company was established in the year 1837, the Cunard Company and the Royal Mail Company in 1839, and the Pacific Steam Navigation Company in 1840. Each of these commenced, comparatively speaking, on a big scale. It was the intention of their founders that they should be important undertakings from the very beginning. They enjoyed Government support, and each received a substantial annual subsidy for carrying the mails. From the commencement, companies like these have been managed by a Board of Directors, and with increasing trade, there has been a corresponding growth in importance. The P.&.O. Company, as it is familiarly known, has now a paid-up capital of three and a half millions sterling, represented by a fleet of eighty-nine steamers, measuring half a million tons. The Company has known fluctuations in its fortunes during its life of three-quarters of a century, but its position in the world of shipping is as high to-day as ever it has been. The Royal Mail Company, owing to the successful policy of combination pursued by its managers, is even more typical of modern methods in liner management. To give some idea of what has recently been effected by this method, it should be remembered, that a quarter of a century ago the British India Steam Navigation Company owned the largest number of steamers, with the greatest aggregate of tonnage of any company in the world. Even up to the present time it has held its own to the extent that it owns one hundred and eight steamers, whose total measurement is over eleven thousand tons greater than that of the P. & O. Company. To-day, however, there are several companies, if combinations are counted, which exceed, both in number of vessels and in tonnage, the company which headed the list twenty-five years ago. Of companies managed by a single Board of Direçtors the Hamburg-American Line now comes first with a fleet numbering four hundred

CHAPTER III

SHIPPING CONFERENCES

THE capital required for operating railway services is much greater than that required for shipping. This is at once noticed if a comparison be made between the capital of an important Steamship Company and that of one of our large railways. Five and a half millions sterling is the capital, including debentures, of the largest British Shipping Company, but more than one British railway has an authorised capital of over one hundred millions sterling. The cause of the great difference is very quickly realised. The railway not only has to provide vehicles, depôts, and stations, but it has to own and equip its own roadway. The conditions of railway service, too, favour monopoly; indeed experience shows that a railway monopoly is capable of great abuse, and requires to be very carefully restricted in the interests of both the trader, and of the travelling public. On the other hand, when once a ship is constructed and equipped for sea, the road she is to travel is ready for her, and at no cost to the owner. Even when in port, docks and wharves have been provided, for the use of which rates, it is true, have to be paid, but whereas the railway company has to provide both vehicle and roadway, stations and depôts, the ship-owner need but provide the ship. The ability to operate a ship with a comparatively small amount of capital may appear to give an advantage to the ship-owner, but there are certain drawbacks connected with a free roadway, and these have occasioned some interesting developments in the shipping industry. The railroad involves a monopoly, the ocean highway means freedom, and the possibility of unlimited competition on all, or most of, its routes. This is no new fact, it is as old, at any rate, as the competition between the English and Dutch in the East Indies three centuries ago. But age has not changed the hard facts of shipping experience, nor does it prevent excessive construction of tonnage when over-sanguine owners hope to make big profits,[1] and only realise too late that they have sadly miscalculated the commercial situation.

With the great development of ocean transport, which commenced about half a century ago, competition became very much accentuated. As the markets became increasingly normal, and trade progressively regular, there was from time to time more tonnage available at a given port than there was cargo ready for shipment. With unlimited competition this led to the cutting of rates, and at times shipping had to be run at a loss. The result was that shipping became an industry enjoying very fluctuating prosperity. Several lean years would be followed by a

[1] *Cf.* Appendix on Shipping Profits.

series of prosperous years. The wealthy ship-owner could afford to put the good years against the bad, and strike an average; a less fortunate colleague, after perhaps enjoying a prosperous time, would be unable to face the lean years, and have to give up the struggle. Such an experience is bad for any industry, it is disastrous in the case of an industry which is of so vital importance as is shipping to Great Britain. Not only does it tend to restrict healthy development in shipping itself and lead to a certain speculativeness which is a bad element in any industry, but it has been found to result in irregularity of trade, a jumpiness of the markets, an uncertainty of service, and an entire lack of uniformity as to rates and freights, which have at times had a very unwholesome effect on a great part of the commercial world. This accentuates unemployment and its attendant evils, and brings into existence a commercial condition which the enemies of the present industrial organisation are not slow to criticise. Of recent years this situation has to a very great extent been modified, trade has become more regular, and commerce has shown signs of becoming more normal. If this improvement could be fostered, and regularity take the place permanently of irregularity, a very great advance would undoubtedly be made in the amelioration, not only of industrial, but of social, conditions.

The shipping interest has long been aware of the harm that may be wrought by unrestricted competition. Not only do their own profits suffer, the point which concerns them most, but many of the leaders of the industry realise how greatly the position might be improved all round could they but find some way to obviate and prevent these fluctuations which appear to be inseparable from shipping business. In the palmy days of the sailing ship, the evil, though its scope was more restricted, was none the less severely felt, and attempts were made to find a remedy. Early in the 'seventies, shipbrokers began attempting to form rings in connection with the more regular trades. Usually there would be several shipbrokers engaged in each trade, and each broker might have one, or even more, ships on the loading berth at the same time for the same destination. In the attempt to get cargo, a broker would cut rates, or ships would sail perhaps long after the advertised date, and then not be fully loaded. The whole situation involved loss, and presented a sad illustration of wasted energy.

Some of the more far-sighted brokers sought to devise a system by means of which this unsatisfactory state of affairs might be ended, or at any rate its worst faults be remedied. The solution which gave the best promise of effecting the desired end was the substitution of a certain amount of co-operation for reckless competition. If all the main interests could work together, and by making use of the information which was, thanks to modern facilities in communication, becoming increasingly complete, then chaos might be reduced to order, and a regularity of service, freight and rate might become the rule. The difficulty was that there were so many interests to consider, and hitherto all had been so mutually suspicious, that anything in the shape of a working understanding appeared to be impossible. However, an attempt was made at forming a ring of the brokers in one trade. The objects of the ring were to fix a freight, as fair as possible to all parties, give regularity of service, and punctuality in despatch. Only one ship was to be on the loading berth at a time, and that ship must be adequately loaded before she sailed, and another ship took her place on the berth.

This was the somewhat immature attempt to stem the strong current of unrestricted competition which was felt not only to be ruining the best interests of shipping, but at the same time was adversely affecting even wider circles.

The rings thus formed taught a good many lessons. They were not altogether successful, indeed attempts were made to break them, and for this purpose an opposition ship would be put on the berth, and there would ensue a war of rates. Sometimes the attacking forces were successful, and the ring was beaten, the usual result being the admission of the opponent to the ring, and for a time harmony would reign until another attempt would be made to break up the combination. The weak spot in these rings was that beyond the influence of the component firms, there was no adequate means of asserting authority, and compelling obedience to the regulations of the association. The organisation was incomplete, some weapon sufficiently powerful to maintain the monopoly of the ring must be forged, or the attempt to regulate the industry must fail.

Not only, however, were sailing vessels' freights suffering from unrestricted competition, but after the Suez Canal proved to be a trustworthy highway for steamers, a great impetus was given to the building of steam tonnage, both for the regular lines already in existence and for newly-established companies. Moreover, a new type of steamer, which rapidly increased in numbers and proved itself to be ubiquitous, began competing both with the regular liners and with sailing ships. This new type, as has been seen, is known as the tramp. It is not altogether easy to differentiate between the liner and the tramp, the line of demarcation is nowhere very clearly defined. A tramp may become a liner, a liner may at times become a tramp. The distinction is perhaps rather in the owners than in the vessel. There are ship-owners who are intimately connected with some trade or trades in which they run a regular service of steamships carrying cargo, mails and passengers. The line may be for cargo only—cargo steamers are constructed for the liner trades, although more usually the term connotes the carriage of mails and passengers. The important point is the regularity of the service, this makes the vessel a *liner*.

But there are other ship-owners whose business it is to operate a steamer that can go anywhere and do anything. They have built a ship for the purpose of making the most of her. And for this purpose they are continually on the watch in order that their tonnage may be at those ports where there is, at the moment, the greatest amount of freight at the best rate, waiting for shipment. Naturally the profits of the owners of the regular liners suffer through this irregular competition, because when a given trade is dull the ordinary liner alone takes part in it, but when good times come, down swoop the tramps and spoil the market for the liners.

That is one way of looking at the question, but from a broader point of view, the tramp has proved a most valuable adjunct to commerce. It is vessels of this description that have in many instances opened up new trades; that have followed what looked like forlorn hopes, which did not attract the liner. Many a trade owes its inception to the tramp, and the tramp-owner in some cases has had his reward by being able to develop an irregular and fluctuating trade, until its dimensions required that he should run a regular line of steamers, where, at one time, occasional visits by a tramp were sufficient for the needs of an incipient port and its hinterland.

The history of shipping during the past twenty or thirty years shows that with developing and more regular trade, the sphere for the liner companies has been very greatly extended; indeed the tonnage and the number of liner companies have alike increased. At the same time, and going on hand in hand with this development, vessels of the tramp class, too, have increased very considerably in number and in capability. In fact the improvement in the cargo carrier is as remarkable as that in the liner. The chief requirements in a cargo steamer, are cheapness in cost of construction, economy in working, great cargo-carrying capacity, and safety. Both owners and builders have had these in view, and as a result the modern cargo steamer is a remarkably efficient vessel. For mail and passenger services the first necessities are regularity, speed, safety, and comfort; the cost of construction and economy in running are indeed secondary considerations. It is not, however, correct to make these the distinctions between a liner and a tramp, for although no expensively constructed fast passenger steamers are to be found among the tramp class, many cargo steamers built on the above principles are liners.

It has been said that "the tramp goes everywhere, competes for everything against everybody, cuts into any trade, British, foreign, or colonial, whenever he can see a profit: and he is similarly subject to attack with no means of defence except his own efficiency."

This is only to some extent true, for, of recent years, there has been an attempt to limit reckless competition. This action has developed from the shipping rings which were first formed in the days of sailing ships. These rings, as has been shown, lacked an efficient weapon to enforce their regulations. But the Shipping Conferences have discovered a very effectual weapon in what are called *deferred rebates.* An old and interesting custom connected with freight charges has suggested the deferred rebate. In the old supercargo days there was an extra charge called primage, which figured in freight accounts. This usually amounted to 10 per cent. of the freight. It is said to have been originally a gratuity given by the shippers to the Captain of a ship to enlist his good offices on behalf of the cargo while in his charge, and on handing it over to the consignees. The necessity for enlisting the Captain's assistance ceased to exist, but primage continued to figure in freight accounts. To anyone asking what this primage represented, the usual answer was, that it was a payment for the use of ship's gear in loading and discharging cargo. Primage in time became utilised by shipping companies to induce merchants to ship by their line. Half or even more of the primage would be returned to a merchant who shipped regularly by the same company. The system of deferred rebates which has proved itself so powerful a weapon of defence for Shipping Conferences is a development of this practice. It was argued that if the rebate be subject to a deferred repayment, there would be a very secure hold over the shipper. Thus in contracting for freight, the shipping companies inserted a clause in the agreement to the effect that in consideration of the merchant shipping exclusively with the Conference lines for a given period, six or twelve months, if at the end of the period he made a declaration that he had shipped exclusively by ships in the Conference, he would be entitled to a return of the primage in full; if not the primage would be forfeited. As the rebates amounted during such a period sometimes to a very considerable sum, the hold of the Conference over the merchant became exceptionally strong.

Thus a Shipping Conference is a combination, more or less close, of shipping companies, and has been established to regulate and restrict competition in the carrying trade on a given route. The vessels owned by the Conference companies are of two kinds: (1) passenger and mail liners, usually ships of high class and speed, operating according to a regular time table; (2) cargo liners, either belonging to the companies, or chartered for a voyage or a period of time. These are less expensively constructed ships, capable of handling cargo economically. It is usual for each separate trade to have its Conference; thus the mutual engagements entered into by the various shipping companies only apply to trade within definite areas, or between specific ports. A company may belong to several Conferences, and yet its engagements to one are independent of those to any other.

There are two main aims in view in forming a Conference. The first object is to regulate competition between the regular companies themselves, so as to obtain and maintain regular rates of freight.

To this end an agreement is entered into by the companies within the Conference that they will charge uniform rates of freight: and it is usual to apportion the traffic either by fixing the number of ships which each line may despatch during a given period, or by allotting certain ports, or by pooling an agreed part of the freight. It is thus that competition between members of the Conference is regulated and kept within fixed bounds. The second object in forming a Conference is to restrict outside competition, and it is for this purpose that the deferred rebate system has been found so efficacious. The Report of the Royal Commission on Shipping Rings[1] thus describes the deferred rebate system: "The Companies issue a notice or circular to shippers informing them that, if at the end of a certain period (usually four or six months) they have not shipped goods by any vessels other than those despatched by members of the Conference, they will be credited with a sum equivalent to a certain part (usually 10 per cent.) of the aggregate freights paid on their shipments during that period, and that this sum will be paid over to them, if at the end of a further period (usually four or six months) they have continued to confine their shipments to vessels belonging to members of the Conference. The sum so paid is known as a deferred rebate. Thus in the South African Trade at the present day the amount of the rebate payable is 5 per cent. of the freight paid by

[1] *Cf.* Cd. 4668, 1909, Part II., p. 9, §§ 23–26.

the shipper. The rebates are calculated in respect of two six-monthly periods ending with the 30th June and 31st December repectively, but their payment to the shipper is not due until a further period of six months has elapsed, that is to say that, as to shipments made between the 1st January and the following 30th June, the rebates are payable on the 1st January following, and, as to shipments made between the 1st July and the 31st December, the rebates are payable on the following 1st July. It follows that in this instance the payment of the rebate on any particular item of cargo is withheld by the shipowners for at least six months and that, in the case of cargo shipped on the 1st January or 1st July, it is withheld for a period of twelve months. If during any period a shipper sends any quantity of goods, however small, by a vessel other than those despatched by the Conference Lines, he becomes disentitled to rebates on any of his shipments by Conference vessels during that period and the preceding one.

"In order to obtain the rebate due to him, a shipper has to make a statement on a form of claim prescribed by the Conference Lines to the effect that he has complied with the conditions of the rebate circular, and, in the case of most Conferences, this statement has to be sent within a prescribed period to the Shipping Company from whom the rebates are claimed. If a shipper has shipped goods by more than one Company in the Conference, he claims from each of those Companies the amount of rebates due upon his shipments in each case. The rebates, that is to say, are usually paid by the individual members of the Conference and not by the Conference as a whole. In the case of the Colombo Homeward Conference, however, the rebates are claimed from and paid by the Conference as a body; and in the case of the Liverpool section of the Australian Conference rebates are claimed through a central office established by that section.

"Such is the essence of the rebate system. The methods by which it is enforced vary in the different trades, and an account of them will be given in a subsequent part of this report. Here it is only necessary to point out that the chief object of the system is to bind the shipper to the Conference Lines by making the receipt of a sum of money in the form of a rebate of freight contingent upon absolute 'loyalty' to the Conference, so far as shipments within the area of the Conference are concerned. The system imposes a continuous obligation upon the shipper to send his goods by the Conference Lines. The shipper, it is true, is not bound to send his goods by the Conference Lines. He does not by contract, expressed or implied, bind himself to do so. But for the shipper who has sent goods by the Conference Lines there is, unless he chooses to cease shipping altogether for a considerable period, no day in the year on which he is free to ship by 'outside' vessels, save by foregoing his rebates. Thus in the South African trade the shipper who on the 1st January claims rebates on shipments between the previous 1st January and 30th June has already been credited with a certain sum in respect of his shipments between 1st July and 31st December, but he becomes disentitled to these if he ships once by an outside steamer in the next six months, and by the time that the repayment of these rebates is due he has been credited provisionally with others, for which a further period of six months' 'loyalty' has to be served.

"The cardinal principle of the system is that a shipper, who during a particular period ceases to confine his shipments exclusively to the Conference, loses his right to the rebate not only in respect of goods shipped during that period, but also in respect of goods shipped during the previous period."

The first Conference was established in August 1875, to regulate the Calcutta trade. Equal rates of freight were fixed, but as was to be expected, those shippers who had been able to make exceptional arrangements for freight were not at all satisfied. In order to prevent the success of the attempt, some steamers were put on the berth and low rates were quoted. The Conference owners then tried a kind of conciliation, but their object was the same, namely, improved freights, and it was this that the shippers disliked. To get over the difficulty, in September 1877 the deferred rebate system was introduced and applied to shipments of Manchester goods; the system was *deferred* because the rebates were to be computed for a period of loyalty, but were not to be actually paid until the shipper had for a further period shipped all his freight by Conference steamers.

Other trades followed the lead of the Calcutta Shipping Companies to protect outward freights. In the year 1879 the China Conference was formed, and in 1884 the Australian, in 1886 the South African, and in 1895 the West African and North Brazilian. In 1896 the River Plate and South Brazilian trades followed suit, and the West coast of South America in 1904. Thus with the exceptions of the British coasting trade, and the North Atlantic trade, the Conference system now regulates most of the cargo, except coal and special shipments, exported from the United Kingdom.

"Each Conference has its own area; and in certain cases where several trade routes intersect or adjoin one another the various Conferences have understandings or agreements with one another to respect each other's spheres of influence. This is especially evident in the trade with India and Ceylon, which is in the hands of a group or family of Conferences, related to one another, members of each of them being also members or part members of other Conferences. This interdependence secures a harmony of action in the working of these various bodies and prevents the clash of interests which might ensue, were Conferences free to engage in mutual competition. Thus an understanding is said to exist between the Rangoon and Calcutta Conferences, under which the Lines of each abstain from trespassing on the domains of the other. Similarly the various Conferences in the trade with South America abstain from encroachment, no doubt from fear of retaliation.[1]"

The reasons why there is no Conference connected with the coasting trade of the United Kingdom is that this trade has to compete with land transport agencies, and the principal of these, the railways, in many instances, have steam services linking up their own rails or connecting with the Continent; the effect of this is to limit the rates that can be charged. So far as the North Atlantic trade is concerned, although there is no Conference to regulate cargo rates, there is a very complete Conference which includes all the principal British and Continental Companies, for the passenger service, which is the main element of the North Atlantic trade. For this passenger trade, very specially constructed steamers are now provided, the regularity of sailing is comparable to that of railway services, whilst the large number of steamers required for the carrying of mails and passengers have a cargo carrying capacity far greater than the goods available for freight. Thus freights are abnormally low on this route, and not only is there no scope for tramp tonnage, but a rebate system could not with any advantage be established.

Difficult as it proved to arrange efficient Conferences in the export trade, it has been found very much more so to apply the system to homeward-bound cargoes. The reasons for this are briefly: (i) that the export

[1] Cd. 4668, p. 12.

trade consists mainly of manufactured goods, the import trade of raw materials sent in bulk in shiploads; (ii) the relation in size that the homeward trade bears to the outward trade. Considering these two points in detail, the export trade consists for the most part of manufactured goods, for exported coal is not in most cases subject to the system. The merchants wish naturally to enjoy the convenience of despatching valuable manufactures in comparatively small quantities. For instance, in the Indian trade evidence was given before the Royal Commission on Conferences to the effect that the average number of separate parcels shipped by merchants (other than the Indian Government or the Railway Companies) in one liner, is about 1150, the weight of each parcel averaging from 3 to 4 tons. Moreover, some of the goods are of considerable value, and speed in delivery is of importance. Thus large exporters are sending numerous shipments of comparatively small weight, requiring quick despatch. They have not sufficient in either weight or bulk to load a steamer, hence the deferred rebate system enables them to get a satisfactory service at a fairly reasonable rate. But if the homeward bound cargoes be compared with this, it is at once seen that the conditions are very different. In the first place the great bulk of the homeward freight is raw material. There are certain commodities, for instance food stuffs, requiring refrigerating equipment; and silk, tea, and valuable goods requiring as regular and speedy a service as the outward goods, but these by no means bulk largely in the homeward cargoes. The chief commodities, so far as bulk and weight are concerned, are wool, corn, rice, ore and timber, for which the demand is constant all the year round. Moreover, these goods are frequently seasonal in character, or at any rate ready for shipment in large quantities at one time, which means that they can be shipped in bulk in whole cargo-loads from one port to be transported to one port. The high-class liner is not necessary for such goods, nor is speed so necessary as cheapness of freight. It is for this trade that the tramp and the sailing ship are required. For the liner, if carrying such goods at all, is carrying them rather as ballast than as cargo, and accepts as a rule a low freight for the service.

"It is the rate at which a tramp steamer or sailing vessel can be chartered, which for a large proportion of the homeward cargo determines the rate of freight to be paid; and it is in the nature of the trade of the tramp steamer that this rate should vary. The owner of the tramp steamer does not confine his operation to any particular trade. He sends his steamer wherever it is likely to earn the highest freight, and the rate which he charges to the charterer depends not merely on the service for which it is chartered, but also on the freight prospects at the port to which the vessel is destined to go. Thus, for a tramp or sailing vessel chartered to carry bulk cargo to Australia the rate would be much lower if the engagement would enable the vessel to reach its destination about the time when a large quantity of grain would be there forthcoming for shipment.

"These are not the only differences between the tramp and the Liner; but they are sufficient to show that in trades where a large proportion of the commodities are of a kind suitable for shipment in tramps it is difficult for the owners of Line steamers either to organise the trade in concert, or to insist upon shippers sending all their consignments in Conference Steamers.[1]"

The second difficulty in the way of the application of the system to several of the homeward trades arises from the relation in size which that trade bears to the outward trade. For instance in the China trade there is but little return cargo, and thus the homeward freight is subsidiary. In other trades the converse of this is the case, as for instance in the River Plate, Australian, and Indian trades. The Conference lines carrying the outward freight are not always able to cope with the quantity of cargo for homeward shipment, and thus are unable to enforce regulations so completely. Still the deferred rebate system has successfully been imposed on many of the homeward trades, either completely or in part. The Report of the Royal Commission gives an account of this in some detail.[2]

Of recent years the shipping belonging to Continental States has been greatly increased, and with this development there has been a growing competition

[1] Cd. 4668, p. 13. [2] *Cf.* Cd. 4668, pp. 14–18.

with British tonnage. It became obvious to both parties that if the Conferences could be enlarged so as to embrace the whole of the shipping interests, it might lead to an all-round benefit. English eastern and south coast ports were open to the calling of Continental shipping for the purpose of filling up cargo space at reduced rates, and on the other hand British steamers could employ the same policy at Continental ports. In some cases it has been found possible to extend the membership of an existing Conference so as to include Continental Shipping Companies, but there are cases where it is the possibility or the effect of Continental competition, that has led to the formation of an International Conference, or there are two distinct Conferences working together under agreements. In any case the procedure generally followed has been based upon [1]:

(1) a division of areas;
(2) a consolidation of rebate systems, under which the same rebate conditions apply to the trade not only from the United Kingdom but also from the Continent;
(3) an agreement or understanding that the same rates are to be charged on similar goods from the United Kingdom and the Continent.

"(1) *Division of Areas.*—The division varies according to circumstances. In some cases, more particularly in the carrying trade to British Colonies,

[1] *Cf.* Cd. 4668, pp. 20, 21.

such as British West Africa, South Africa, and Australia, the British Lines maintain their right to carry from all Continental ports, and the Continental Lines are confined to trade from Continental ports. In others again, as for example in most of the South American trades, the British Lines are entitled to the exclusive trade from British ports, but, though they participate with the Continental Lines in the trade from certain Continental ports, they are not allowed to carry from German ports. In others again, as for example in the Calcutta Conference, the recent war between the Peninsular and Oriental and British India Lines on the one hand and the Hansa and Well Lines on the other has resulted in an arrangement by which the British Lines are entitled to carry from Antwerp, and the two foreign lines from Middlesbrough and London to certain Indian ports. In the trade to the Far East, owing to the great extent of the area covered by the Conference and the number of Lines concerned, the division of the traffic is of a complicated and detailed character. The Conference area is the trade from the United Kingdom, Belgium, and Holland to the Straits Settlements, Malay Peninsula, Siam, Philippine Islands, Hong Kong, Kiaochow, Port Arthur, Wei-hai-Wei, China, Japan (including Formosa), and Corea. The main Conference consists of the Peninsular and Oriental, Ocean Steamship Co., Messageries Maritimes, North German Lloyd, Nippon Yusen Kaisha, Glen, Shire, Ben, Shell, Mutual, and Mogul Companies. These Lines, quite apart from their usual Conference arrangements with one another for the division of traffic, have agreements with a number of foreign Lines, under which the latter are admitted to certain carefully defined portions of the trade. Thus the East Asiatic Co. of Copenhagen and the Russian East Asiatic Co. of St Petersburg are only allowed to carry goods from Antwerp; the Hamburg America Line are not allowed to take any cargo from United Kingdom ports except pig-iron from Middlesbrough for Japan; the steamers despatched by Mr Eugen Collier and Mr Dieckmann of Hamburg are confined to sailings from Antwerp to Port Arthur; the Nederland Line and the Rotterdam Lloyd are restricted to shipments from Rotterdam and Amsterdam to the Straits Settlements; and the Compagnia Transatlantica to shipments to the Straits Settlements and Philippine Islands.

"(2) *Consolidation of Rebate Systems.*—In practically all the trades, in which agreements of this nature exist between British and Continental Lines or in which British Lines carry from the Continent as well as from the United Kingdom, the area to which the rebate system applies includes the Continent or certain specified Continental ports as well as the coastline of the United Kingdom. This holds good even in some cases where British Lines do not carry from the Continent or certain Continental ports. Thus in the River Plate Conference, although the British Lines are not entitled to carry from German ports, the rebate circular requires from shippers 'loyalty' to the German Lines who are entitled to carry from German ports. The German Lines similarly require 'loyalty' from shippers sending goods from British ports from which they are not entitled to carry.

"(3) *Agreements as to Rates.*—The inducement to enter into such agreements arises out of international trade competition. Though steamship Lines are seldom confined to the carriage of goods from the country to which they belong, in most cases it is from the cargo received at national ports that they draw their chief revenue. It is therefore to their interest that the rates of freight on goods carried from competing countries should not be so much lower than the rates on national cargo as to divert trade."

The formation of Shipping Conferences has considerably affected the world of commerce. Some authorities consider that their influence has been advantageous, others criticise their methods and express doubt as to any benefit resulting to the shipper. The principal advantages claimed for the system are that by means of Conferences regular sailings and systematic rates of freight are obtained, that whilst these enable the companies to operate a better type of steamer, there is a greater economy in management, and hence the freights charged are not only more uniform, but on the whole lower, than would otherwise be possible. On the other hand, it is alleged that the Conferences have led to excessive rates being charged from British ports, whilst from Continental and American ports rates have been so much lower that foreign manufacturers and shippers have benefited. Undoubtedly some instances were brought to the notice of the Royal Commission which bore out this complaint. Indeed, both the advantages and disadvantages of the system were brought into the light of day, and much was done towards lessening misunderstanding on a very complicated subject. The peculiar conditions under which the shipping of the world is carried on, and its special liability to suffer from excessive and unregulated competition, proved the necessity for some system by means of which, under modern conditions, regularity and order might take the place of rule of thumb leading on to a chaos that was neither advantageous to shipping, shipowners, nor the general public. The whole trend of modern commercial life is towards greater regularity, thanks to improved methods of communication and facilities for collecting information as to crops and market demand and supply in various parts of the world. It is unthinkable that the very freedom of the ocean routes should not only foster, but render permanent, a state of affairs which tended to reduce a great industry almost to the level of gambling. It was to be expected that the initial attempts to bring about a better state of affairs would not only arouse opposition, but naturally contain imperfections, calculated to cause genuine grievances. When the movement towards Conferences commenced, England was so pre-eminent in commerce that the organisers of shipping rings probably did make certain arrangements which proved to be disadvantageous to the British shipper and manufacturer. What was wanted, and indeed what is being achieved, is that all the interests concerned should work together and produce a system which, whilst restricting abuses on all sides, may give the maximum of benefit to all concerned. It is but natural that the ship-owner, as any other business man, should make the best terms he can for himself. But in the long run he knows quite well that shipping interests are bound up with those of the importer and exporter, and that thus it is to his interest that all should work harmoniously together.

The great weapon of Conferences, the rebate system, has been attacked from several quarters. In 1912 the South African Government compelled the Mail Company either to abandon the rebate system or lose the mail contract; and eventually the other shipping companies who are members of the Conference also abandoned the rebate system. But the Conference continues to exist, and in place of its old weapon is experimenting with a form of mutual agreement. This binds the shippers to ship their goods by the regular lines, and the lines to charge uniform rates which have been mutually agreed. This arrangement is clearly a step in the right direction, and with the experience of time may lead to the perfecting of a system whereby the interests of all concerned will be the basis of the agreement. Indeed, it may be hoped that other trades will watch the results of the South African lead, and adopt those parts of the new system which are applicable to their special interests.

One great improvement being effected by Shipping Conferences is the standardisation of the Charter Party used in each trade. Each trade has its own special conditions and limitations, making it impossible to produce one standard Charter Party for all routes. But it is possible to prevent a very great amount of inconvenience and misunderstanding by making use of one standard Charter Party in each trade, and this is being accomplished with very beneficial effects. Not very long ago there were as many different charters as there were lines operating on each route; now, thanks mainly to the Conferences, the Standard Charter Party is within measurable distance of becoming an accomplished fact.

Another benefit which will be the outcome of greater regularity in our shipping is the gradual improvement in the position of the casual labourer at our great ports. No greater scandal existed than the conditions of casual employment at the docks. With unrestricted competition and irregularity as the ruling characteristics of our shipping industry, this scandal was not only most difficult to deal with, but well-nigh impossible to mitigate. With growing regularity of sailing and arrival, with order and system taking the place of chaos, it has been possible to remodel the system for the employment of a great mass of unskilled and semi-skilled labour at the ports, and although during the past few years there has been, as might have been expected, great restlessness among the transport workers, it cannot be doubted that a new era has dawned, and that the future for this class of worker is going to be better ordered, their standard of living higher, and their employment more regular and satisfactory. The Conferences were doubtless formed without any idea of affecting the casual labourer; their effect on his condition, however, has indirectly been very considerable. Had irregularity continued to be the rule in shipping, the casual labouring class must have remained a permanent blot on our civilisation.

To conclude this account of shipping Conferences, a short abstract from the Annual Report of the Acting Consul General for Brazil may be quoted [1]:

"The revenue estimates for 1913 now before Congress contain a clause the object of which is to do away with the system of rebates on freights by placing companies which adopt the scheme under great disabilities. The application of the clause in question is liable to hit regular shipping companies very hard, but it is probable that the arguments which have been collected by the Centro de Navegacao Trans-Atlantica (Association of Shipping Companies), and presented to the Government, will militate against the Bill becoming law, at any rate for some time. The clause, as it has passed the

[1] Diplomatic and Consular Reports, Brazil, No. 5049, Cd. 6665-7, 1913, p. 18.

third reading in the Chamber of Deputies, appears to be so worded as to allow the continuance of the old system at the discretion of the Government.

"The system that has been in vogue for many years past is that the well-known, regular lines have banded together and offered shippers a certain rebate if the latter ship throughout the whole of the crop year by their steamers only. This is not meant to constitute a monopoly or a trust. It is a system adopted by the regular lines in self-defence, with the object of keeping out tramp steamers. As the crop only lasts about six months, it is obvious that for the other six the lines will have to run at a dead loss. Naturally they have to recoup their losses during the other six. If, however, the tramp steamers are not kept out by the rebate, they would be able to come in during the crop and quote freights which would pay them but would not pay the regular lines in making up their losses. The system has, among others, one great advantage, namely, that of ensuring the stability of freights. All the important shippers, both in Rio de Janeiro and in Santos, have signed a document expressing their entire approval of the rebate system. Ship-owners, shippers and consignees all appear to favour the system, but the Government apparently argues that the abolition of the rebate system will ensure much better shipping facilities.

"Theoretically the system in vogue may be open to objection; in practice it seems to have much to commend it. Comparison with other countries where the system of rebates has been abolished is hardly fair, as the conditions here are quite special. To take only one point of difference—regular exportation takes place in certain months of the year only, and not regularly all the year round."

CHAPTER IV

CAPITAL AND EARNINGS

It would be exceedingly difficult to give even an approximate idea of the amount of capital that Great Britain has invested in shipping and its attendant industries. Last year (1912) Lloyd's register shows that the gross tonnage of ships and steamers belonging to the United Kingdom was 18,213,620, which, together with 1,660,740 tons belonging to the Colonies, gives a total of 19,874,360 tons belonging to the Empire. But this tonnage is made up of ships of very different value. For instance, there is something less than three-quarters of a million tons of sailing ships altogether, and all of this is of comparatively small value. Moreover, the value of the tramp tonnage is very much less than that of the mail steamers, whilst there are ships of very different values in each of these classes. At the same time twenty million tons of shipping represents a very large amount of capital. An approximate value of what that total value is may be obtained by making use of some figures published towards the end of last year by "Fairplay," showing the working of some representative passenger and cargo steamship lines during the year

1912. This table gives particulars of twenty-four passenger companies and one hundred cargo steamer companies. The former own 4,182,828 gross tons of shipping, which has a book value of £46,739,492, or an average of about £11. 3s. 5d. per ton. The latter have a gross tonnage of 1,981,209, valued at £16,477,354, or an average of about £8. 6s. 4d. per ton. The total tonnage of which particulars are given, is 6,164,037, or rather more than one-third of the total owned by the United Kingdom. If these values can be taken as a fair average of the whole tonnage, and it be allowed that of the total, one-third is liner tonnage and the balance cargo steamers, with a small amount of sailing ship tonnage, then the total value in round figures would work out at about £164,484,396, made up of:

6,000,000 tons Mail and Passenger Steamers @ £11. 3s. 5d. per ton	=£67,150,000
11,542,030 tons Cargo Steamers @ £8. 6s. 4d. per ton. . . .	= 95,991,216
671,590 tons Sailing Ships at, say, £2 per ton	= 1,343,180
	£164,484,396

To the value of the actual tonnage must be added the capital invested in depots, docks, harbours, wharves, warehouses, repairing establishments, and the many other industries required for the actual working of the shipping industry. Nor would this by any means exhaust the whole list of the allied interests, for there are the shipbuilding yards and all that they entail, and the many special manufactures, from those connected with the production of steel plates and other construction material, together with the making of anchors, cables and ropes, to the minor trades which produce the special small fittings employed in the building, repairing, and equipment of a ship. When one commences with collieries, mines, and smelting works, and goes through all the trades whose well-being is intimately connected with British shipping, it becomes apparent that not only is shipping important to the United Kingdom because it transports a great part of the food supply of the country, but the industry itself, together with all the attendant industries, is one of the greatest factors in our industrial life. For in addition to the immense amount of capital just referred to, employment is given to a very considerable army of labour, included amongst which would be found some of the most highly skilled and valuable labour employed in the United Kingdom. But both as regards employment and capital it is only possible to surmise, and it is not possible to obtain even an approximately accurate idea in figures. The earnings of shipping have always been subject to great fluctuations. In the old days of shipping ventures, when all went well several hundred per cent. sometimes resulted from a successful voyage. But against this it was necessary to set the losses of other ventures, and although the fortunate owner in the long run came out a gainer, shipping was not an industry in which people of small means or timid dispositions should take part. This has remained a characteristic of the industry throughout its history. It is true that in many ways ocean transport business has been systematised and made more regular, and that modern commercial methods have obtained some of their greatest successes in connection with shipping business. But, as has been traced out, the great ocean trades have been developed by regular lines of steamers, and so far as these are concerned the industry pursues a normal course. For these companies, on the whole, carry on fairly regular business so far as tonnage and passengers carried are concerned, but freights fluctuate between times of depression and times of prosperity. Thus even the regular lines have a difficulty in maintaining a steady rate of dividend on the ordinary share capital.[1] They do, however, enjoy a considerable advantage in this respect over the tramp companies, a fact which helps from another point of view, than those already considered, to differentiate the liner from the tramp. The Liners have regular work to do; indeed, the Liner Companies have become an integral part of commercial machinery. One consequence of this is that, when bad times prevail, these companies, though affected in common with the whole commercial world, do not as a rule suffer to anything like the extent to which the tramp companies do. This is owing to the fact that the premier companies, during times of prosperity,

[1] Cf. Appendices Nos. 8 and 16.

build up reserve funds, instead of dividing abnormal profits. But the major part of the tonnage of the world consists of the more humble class of tramp. The owners of these vessels feel very acutely the pinch of hard times; but at the present time (1913) they are passing through a time of almost unexampled prosperity. It would appear from published balance sheets that a lesson has been learned by some tramp owners, and that the present possibilities for earning large profits are leading to improved steamship finance. It will be interesting to watch how this works out as the next trade cycle unfolds itself. It is tramp owners who grumble that ship-owning never did pay. Mr Lindsay pointed this out in his monumental work on Shipping forty years ago. Ship-owning was, and to a great extent continues to be, a wealthy man's occupation. Ship-owners would say that good times come to enable them to lessen their losses, but seldom indeed used they to admit that times were prosperous. Recently, however, with published balance sheets, and shareholders meetings, at which managing directors enlarge on their capability to earn dividends, it has become evident that even tramp tonnage has its good times, and occasionally, when well managed, can pay handsome rates of interest on capital invested.

Going back thirty or forty years, it used to be thought that the Clippers earned huge profits. It is probably true that some of the exceptional ships did well for their owners, but the perusal of a number of accounts showing the results of the workings of the China Clippers over a series of years shows that on the average they only made a fair amount of profit whilst in their prime, and that when run off the China trade by steamers, and compelled to do tramp work on various routes, it was with difficulty that they held their own, and in many instances they were finally sold to foreign owners at a ruinous loss. For the ordinary investor, the sixty-fourther or tramp company was, and probably remains, a form of investment to be avoided. It is a very special business, and it is best financed and managed by those who are versed in its difficulties or interested in its attendant industries. There can be a species of co-operation here which works to the benefit of all concerned, and results in an all-round gain even when shipping is at a low ebb, and a dividend very difficult or impossible to declare. Take, for example, the present condition of tramp shipping. Seven or eight years ago many small shipping companies were hardly able to keep going. From year to year they were balancing small profits against small losses, but during the past two years all this has been changed. Dividends are being paid now on a scale that would have appeared impossible to expect only a few years back. Nor are these tramp companies merely paying dividends, for, as has already been hinted, they are strengthening their financial position in a very remarkable manner. The present good times are enabling competent owners to provide against the lean years that are bound to come.

This is the more remarkable, because, although freights have remained phenomenally high for a comparatively long period, working expenses have very considerably increased. Last February (1913) Mr Noble, the Managing Director of the Cairn Line, in his speech at the annual meeting, announced a dividend of ten per cent. for the year, whilst very satisfactory sums had been allowed for depreciation, and added to the reserve fund. But he went on to point out that working expenses in every department have very greatly increased. Among a few examples he gave were that wages have risen twenty-five per cent., insurance twenty per cent., stores and provisions from fifteen to twenty per cent., and coal twenty-five per cent. Taking working expenses all round, his experience was that they had recently increased by no less than fifteen per cent., which he described as a formidable item for the managing owner to cope with. This estimate has been accepted by other authorities, and may be taken as correct. In a time of prosperity prices always rise. The cost of new tonnage has very greatly increased recently, and the shipbuilding yards being full of work, the price of second-hand ships has gone up as much as from thirty to fifty per cent. But in spite of all these additions to the expenses of operating shipping tonnage, very satisfactory dividends have been declared by the majority of Tramp Companies.

The shipping industry during a period of prosperity presents many points of interest. Ships cost more to build, more to repair, more to insure, and more to run, wages are increased in every grade, and yet the final result, as shown in the balance sheets, is satisfactory alike to manager and shareholder.

The accounts of two typical Tramp Companies show some interesting results if the figures for 1910 and 1912 be compared.

A.	Depreciation a/c.	Net Profit.	Dividend.
1910	£4,000	£8,946	£5,165=6 per cent.
1912	£31,000	£49,385	£9,025=8 ,,
B.	**Reserve.**		
1910	£20,000	£38,457	£10,000=5 per cent.
1912	£40,000	£96,426	£50,000=25 ,,

One company which six years ago netted a profit on completed voyages of £5000, last year netted £60,000! Whilst another shows an increase of nearly 200 per cent. on net profits for the year 1912.

To conclude this section on shipping capital and earnings, reference may be made to a very interesting article contributed to the *Times* newspaper last June at the time that the *Imperator* commenced her career in the Atlantic service. In this article the cost of building and operating these large passenger steamers was considered, and, apparently from inside knowledge, some very interesting figures were published. The great factor in the financial success of one of these steamers is that she become a favourite with the travelling public. If that once be attained, success, barring accidents, is assured. Thus on a 50,000-ton passenger liner, costing £1,500,000 to build and equip, the highest gross earning during the season may amount to £70,000, the lowest gross earnings in the off-season are given at £30,000, as against £32,000 as the cost of running. But over the whole running season a favourite ship would be able to net £17,500 per voyage. With a three weeks' itinerary for eleven months during the year, allowing one month for overhaul and refitting, the ship would net upwards of £250,000.

Allowing 5 per cent. on the capital invested	£75,000
and depreciation at 6 per cent. . .	90,000
and annual overhaul	30,000
	£195,000

The resulting margin yields a good return, but these large steamers have been none too fortunate. There have been a series of mishaps, from the *Titanic* disaster down to the comparatively trivial mishaps which have occurred to some of these ships every voyage, and the question of insuring such large vessels has assumed considerable importance. Indeed, this may be for some time to come a determining factor in deciding what tonnage Atlantic (and other) liners shall attain. The largest passenger companies on the route have made an agreement amongst themselves, forming a subsidiary underwriting company to insure the largest liners. This has been necessitated by the heavy premiums demanded by Marine Insurance Companies on the somewhat uncertain risks. It remains to be proved that under existing conditions these abnormal vessels can be a commercial success.

CHAPTER V

THE CLASSIFICATION AND REGISTRY OF SHIPPING

There are now in the United Kingdom two Societies responsible for the classification and survey of shipping. The senior of these, Lloyd's Register of British and Foreign Shipping, has had a long and varied history. The junior society, the British Corporation for the Survey and Registry of Shipping, to give the full title, has its headquarters at Glasgow, where it was founded in the year 1890. Originally established in connection with the thorny subject of fixing load lines, it has developed into an important Corporation prepared to give advice on matters of ship construction, to undertake the survey of ships under construction and assign certificates ; whilst in addition it carries out all those duties now connected with the work of surveying and classification.

As to Lloyd's Register, it will save much misapprehension if readers bear in mind that there are two great institutions connected with British shipping, each now working independently of the other, in different spheres, but both bearing the name of Lloyd. They commenced their career under the management of shipping underwriters in a Coffee House in the City of London managed by

Edward Lloyd. The habit of meeting to discuss business or politics at a Coffee House appears to have been introduced into Western Europe from Constantinople about the middle of the sixteenth century, first in Venice, thence spreading to Paris and London. In France the Coffee House has remained a Club centre down to the present. In England after their first introduction they became meeting-places for various purposes, but with the lapse of time all this has changed. The first mention of Lloyd's Coffee House occurs in the *London Gazette* in the year 1668. The House was then situated in Tower Street, London, whence twenty-four years later it removed to the corner of Abchurch Lane in Lombard Street. Mr Edward Lloyd gave his attention to attracting the shipping community, and his establishment became the great meeting-place for underwriters and ship-owners. From this circumstance the Coffee House became a convenient place to post information concerning both the movements of shipping, and the particulars of the build and equipment of individual ships. And from what at first was voluntarily supplied by an able and obliging caterer has evolved Lloyd's, an Association of Underwriters, and Lloyd's Registry of British and Foreign Shipping.

It is perhaps somewhat difficult for the outsider to distinguish between these two, though the one has its headquarters at the Royal Exchange, and is a corporation of underwriters, whilst the other has premises of its own in Fenchurch Street, where it carries on the work of registry and classification for a great part of the world's shipping tonnage. It is one of the romances of commerce that a comparatively humble Welshman should have transmitted his name to some of the most important commercial corporations of modern times both in England and abroad. But though only a coffee house keeper, Edward Lloyd must have possessed a personality above the average. It is greatly to be regretted that so little is known about the man who commenced the practice of collecting information as to the shipping which carried on the trade of the day, for that appears to have been one of Lloyd's functions. It was in September, 1696, that *Lloyd's News* began to be issued three times weekly, and though owing to a political reference which offended the Government this paper had to be suspended, its place was taken in 1726 by *Lloyd's List*, a journal which, with the exception of the official *London Gazette*, can claim to be the oldest existing newspaper in the world. The information available at Lloyd's as to the arrival and sailing of ships may have been a survival of an earlier practice. At any rate, in the year 1532 (23 Henry VIII. c. 7)[1] "arrangements were made for the publication in Lombard Street of notice of the sailings of ships." It is interesting that these notices were published in Lombard Street, where a century and a half later Lloyd's was to have its headquarters.

[1] *Cf. Growth of English Industry and Commerce*, Cunningham, i. 435.

From the system of shipping intelligence established by Lloyd, there has grown, under the direction of the great Marine Insurance Corporation which bears his name, an organisation for collecting and publishing information about the mercantile marine, which is one of the most perfect and world-wide institutions connected with commerce. The subject of marine insurance and the association of underwriters known as Lloyd's will be referred to later on; here it is the work of Lloyd's Registry that has to be described.

The volumes now published annually by the Registry had a somewhat humble origin. That shipping people, especially underwriters, should have ready access to authentic information as to the character, build and equipment of a ship, is a necessity of shipping business. The insurance or even the purchase of a ship may have to be arranged while she is away from port. It would appear at first sight a somewhat risky proceeding either to insure or purchase a vessel, representing great capital value, without having the opportunity to make a thorough inspection, but with a register giving full particulars of the ship and her upkeep, as does Lloyd's, an underwriter or a purchaser is placed in possession of full information, and the necessity of inspecting is reduced to a minimum. Marine insurance would be a very burdensome business if, before taking a risk on a ship, or on goods about to be shipped, an underwriter had to make inquiries as to the build, equipment and upkeep of the vessel in question. In other words, with a growing foreign commerce, and a developing system of insurance for both vessel and cargo against the risks of the sea, it became increasingly necessary to contrive some means for ascertaining whether any given ship was seaworthy; and with this, prominence was given to the fact that there are ships of various qualities. Thus with records of this description began the work of classification, which though of a very primitive description at the outset, has developed into one of the most important organisations, safeguarding the interests alike of the shipbuilder, the ship-owner, the shipper of goods, and the underwriter. It was consequently realised that if lists were drawn up by a reliable authority, showing where and when and how a ship was built, and how she had been surveyed and repaired during her career, a great saving in time and anxiety would result to the shipping community. Apparently it was Edward Lloyd who saw the advantage to his clients of having this kind of information available in convenient form. Whether he originated the scheme, or whether it was adapted by his clients from some method practised elsewhere, the fact is well established that at his Coffee House in Lower Thames Street, *Ships' Lists* were kept giving this special information.

Lloyd's Register, as it exists to-day, is a good illustration of the advantages of co-operative effort. It is interesting to practically every class of the shipping community to be able to ascertain the character of a given ship. By the establishment of a responsible committee, representing all these interests, it has been found possible not only to produce a register of shipping which, while giving all the needed details, can be easily kept up to date, but as necessary parts of the same organisation there is a system of regulations and survey by means of which the manufacture of the structural and other materials, the work of constructing ships and their upkeep and repair during their careers, have become the duty of Lloyd's Register—the parent of, and in most cases working in association with, similar institutions throughout the world.

The original lists at Lloyd's Coffee House contained particulars of those ships which the underwriters meeting there would probably be asked to insure. They were at first simply manuscript documents passing from hand to hand, but about the year 1726 it is thought that they began to be printed in the form of a register. The information contained in this Register was exclusively for the use of subscribers, who, if allowing outsiders to consult their copies, were liable to a fine. If this be true, the original Register dates from about the same year as *Lloyd's List*. Unfortunately no copies of the early registers are known to exist. In the library at the offices of Lloyd's Register there is a copy of a register of Shipping dated 1764-65-66. This is the oldest copy known. The information given is very complete, and is very practically arranged in thirteen columns, proving that although this is the oldest existing copy, the Register must have been in existence for some considerable time. In these columns are given the former and present names of the vessels, the owners and captains, the ports between which the vessels were trading, the tonnage, number of crew and guns carried, the place and date of construction. The classification is printed in the column indicating in which year the vessels were surveyed. One column was left blank by the printers, in order that the latest details might be added in writing. Further information as to the deck or decks was given in the gun column. The largest ship registered in this volume measured nine hundred tons; there are two measuring eight hundred each, but the majority are of quite small dimensions.

The method of classification employed in this Register was quite simple. The vowels A, E, I, O, U denoted the class of the vessels' hulls, while for the equipment of a ship the letters G, M, and B, signifying *good*, *middling*, and *bad*, were used. Thus a ship classed AG was first-class both in hull and equipment, while the letters UB denoted a vessel of the lowest class in both respects. It was not until the year 1768 that for the class of the equipment, numerals were employed in place of the letters G, M, and B. But for some curious reason small letters were used in the Register this year to denote the class of the hull of a ship. Thus a ship of the highest class in both respects there figures as a1. Nor was it until the third Register Book that has been preserved, which dates from the year 1775-6, that capital letters are combined with numerals and we get the well-known classification A1 for a ship that is first-class in all respects.

Thus during the eighteenth century the underwriters at Lloyd's established for the sole use of the *Members of the Society* a register book of shipping. At first it was published every two years, then annually. The committee responsible for the compilation of the book, apparently held their meetings at Lloyd's Coffee House, but the office of the Registry was first in Sun Court, and then in Castle Court, Birchin Lane. In the year 1797-8 a new system of classification was introduced, which caused a great deal of dissatisfaction among shipping people. The changes were of two kinds. The class letters were altered, the vowels for the class of the hull being replaced by the letters M for the first class, G for second class, L for third class, and Z for fourth class, whilst the numerals 8 and 4 were used to denote the class of the equipment. A more drastic and impolitic change was made in the rules for classification, since these made a ship's class depend, not on the character, but on the place and date of her construction, ships built on the Thames being accorded special advantages. Complaints having no effect, shipowners determined to establish a Register Book of their own, and this was carried out in the year 1799. The old Register was familiarly known as the Green Book, the new one as the Red Book—the title of the latter being "The New

Register Book of Shipping," and on the title page it says it was issued by a Society of Merchants, Shipowners and Underwriters. In reality it would appear, however, that the new register was established almost entirely by ship-owners.

Thus at the end of the eighteenth century there were two Registers of Shipping, which led to many inconveniences, and as a consequence both Registers suffered in reputation, and financially. After a period of nearly a quarter of a century it became obvious that the two Registers would reap a common benefit if they were amalgamated, and this, after much controversy, was happily accomplished in the year 1834.

The Rules [1] then underwent very material alterations, and in their amended form were adopted at a meeting of the United Committee of the Registry on the 17th January 1834, and ordered to be published in the form of a "Prospectus of the Plan for the Establishment of a new Register Book of British and Foreign Shipping." From this document it appears that the existing Committee were to be considered merely as a provisional Committee for arranging and completing the establishment of the Society on the following basis :—

"All persons subscribing the sum of three guineas annually were to be members of the Society, and entitled, *for their own use*, to a copy of the Register Book, the subscription of Public Establishments being fixed at ten guineas, with the exception of

[1] *Annals of Lloyd's Register*, p. 48.

that of the four Marine Insurance Companies in London, namely, the Royal Exchange, London, Alliance, and Mutual Indemnity, which had each agreed to give an annual subscription of one hundred guineas.

"The superintendence of the affairs of the Society was to be entrusted to a Committee in London, to be composed of twenty-four Members, consisting of an equal proportion of Merchants, Ship-owners, and Underwriters, and in addition, the Chairman of Lloyd's and the Chairman of the General Ship-owners' Society, for the time, were to be *ex officio* Members of the Committee.

"The Provisional Committee were in the first instance to appoint the eight members constituting the mercantile portion of the Permanent Committee; the Committee of the General Shipowners' Society to elect the eight members constituting the portion of Shipowners; and the Committee of Lloyd's the eight Members to represent the Underwriters.

"The vacancies thereafter arising through the annual retirement by rotation of six of the Members, namely, two of each of the constituent parts of the Committee (who would be eligible for re-election), were to be filled up by the election of two Ship-owners and one Merchant by the Committee of the General Shipowners' Society, and two Under-writers and one Merchant by the Committee of Lloyd's.

"The Committee were to have full power to make such Bye-Laws for their own government and proceedings as they might deem requisite, not being inconsistent with the original Rules and Regulations under which the Society was established."

After stating the conditions attaching to the appointment of Surveyors to the Society, the Prospectus proceeds to explain the general principles which the Committee had determined to adopt for their guidance in the future classification of ships, and which are sufficiently clear from the first resolution under this head, namely :

"That the characters to be assigned shall be, as nearly as circumstances will permit, a correct indication of the real and intrinsic quality of the ship ; and that the same shall be no longer regulated, as heretofore, by the incorrect standard of the port of building, nor on the decision of the surveyors ; but will henceforward be in all cases finally affixed by the Committee, after a due inspection of the Reports of the Surveyors and the documents which may be submitted to them.

"In regard to the funds of the Society, which it was provided should be under the authority and control of the Committee, it was decided that the revenue should not depend solely upon the subscriptions to the Register Book, as had evidently been the case with the preceding Register Societies. The subscription to the Register Book, it will be observed, was fixed at a very low figure, but, in addition, fees were to be charged to ship-owners for the survey and classification of vessels according to an approved scale."

With the lapse of years there has been a very great change in shipbuilding. Wood as the chief structural material gave place to iron, and iron has been superseded by steel. Methods of construction too have changed, and so have the propelling methods. Sails have given place to steam; and steam itself having been subject to many improvements, at the present moment is on its trial, and may eventually be superseded. With all these modifications there has been the constant need for classification to be kept effective. Nor has Lloyd's failed to keep pace with the times. As each change has come prominently forward, Lloyd's has noted its possibilities, and if it proved its permanent applicability to shipping, it has been made subject to regulations which themselves have had to be kept up-to-date.

The ship, during the past half century, has been subject to enormous changes in almost every particular, hence it has been no easy matter to keep regulations for classification and survey abreast of the times, and capable of meeting every contingency. There have too, from time to time, been manifestations of a certain amount of local jealousy, a by no means unhealthy feeling, against a great Corporation enjoying almost a monopoly in its special sphere, and having its headquarters in London. But a wise policy of absorption, and perhaps it might be said of extension, has tended to unify interests so far as classification and registration are concerned. Liverpool, proud of her great and growing importance as a centre of shipping, put forward a claim to have independent rights in her own district. To this the London Society could not see its way to agree. However, a *happy mean* was discovered, and now the Committee of Lloyd's consists of seventy-two members, of whom twenty-six are elected in London, ten in Liverpool, eight in Glasgow, eighteen are elected by other ports, and eleven represent the shipbuilding and marine engineering interests of the country. The addition of this last class is of rather special interest.

When the Register, as we know it to-day, was reformed in the year 1834, there were no great shipbuilding and engineering establishments comparable with those now so familiar to the visitor to the Clyde, the North-east coast, or to Belfast. Shipbuilding was still in its infancy. But with the continual advance in constructional and engineering science, it became necessary that the very best skill connected with these interests should be represented on the Committee of Lloyd's Register. Thus rather more than twenty years ago, at the time when the load line question was before Parliament, it seemed possible that Lloyd's Register would be the sole authority under the Merchant Shipping Act, 1890, to approve and certify load lines. But in consequence of representation from Glasgow the important duty was divided between Lloyd's Register, and a newly formed organisation known as the British Corporation. It was then decided by Lloyd's Register to form a consultative committee representing both shipbuilders and marine engineers. Subsequently, to these have been added representatives of the manufacturers of structural materials. Nor has development been arrested at this point, for in the year 1911 these representatives, from being a consultative committee, have, as has been indicated, been incorporated in the main Committee, and share directly in the management. Thus from the year 1911 every interest connected with shipping has been fully represented on the Committee of Lloyd's Register.

As to the present system of classification, it has evolved gradually from that instituted in the year 1834. Then the letter A denoted a ship of the first class, which had not passed the prescribed age, and had been kept in a high state of efficiency; that is, a ship capable of undertaking a voyage to any part of the world. The diphthong Æ denoted a ship in the second rank of the first class. Such a ship had got beyond the prescribed age, and had not been sufficiently overhauled to be restored to the highest class, but remained in a condition capable of carrying with safety dry or perishable cargoes. The letter E stood for the second class. Ships in this class, though not fit for the conveyance of dry or perishable goods, could trade in any part of the world, and carry cargoes not liable to sea damage. A third class was denoted by the letter I, and was conferred on ships which were not considered fit to undertake long voyages, nor to carry dry or perishable goods.

The numerals 1 and 2 were added to the letter, and signified the state of the ship's equipment, *i.e.* anchors, cables, stores, etc. It is unnecessary here to tabulate all the modifications that classification has undergone since 1834. But in the year 1870 it is important to note that the rules for the construction of iron ships were completely redrafted, and the 100 A1 class was instituted. "It is to be distinctly understood that the numerals prefixed to the letter A do not signify terms of years, but are intended for the purpose of comparison only: the A character assigned being for an indefinite period, subject to annual and periodical survey as hereafter described."[1] In the year 1888 rules and regulations for the construction of steel vessels were drawn up, and these had from time to time to be modified. The present Rules and Regulations of Lloyd's Register were drawn up in the year 1909, and embody regulations to meet every possible contingency. The Register's year ends on June 30th, and this year (1913) no less than 10,466 merchant vessels, registering over 22½ million tons gross, hold classes assigned by the Committee; of these over 21 million tons were iron or steel steamers, under 1½ million tons were iron or steel sailing ships, and only 17 thousand tons were either ships or steamers of wooden or composite build.

In the committee's report for the current year it is stated that during the year, 651 new vessels were classed, their gross registered measurement amounting to 1,664,667 tons, the highest total ever recorded

[1] *Cf.* Lloyd's Rules.

for one year in the history of the Society. As showing how completely the steamer has superseded the sailing ship, of the 651 new vessels, all but 58 were steamers, and the measurement of those 58 ships was only a little over 21,000 tons, the steamship tonnage amounting to upwards of 1,600,000. It is also of interest to note that over sixty per cent. of this new tonnage was constructed for owners within the United Kingdom.

TABLE SHOWING THE NEW TONNAGE CLASSED BY LLOYD'S REGISTER DURING THE DECADE 1903 TO 1913.[1]

YEAR.	STEAM. Tons.	SAIL. Tons.	TOTAL. Tons.
1903–4 . .	1,051,960	27,085	1,079,045
1904–5 . .	1,189,769	11,058	1,200,827
1905–6 . .	1,408,579	4,066	1,412,645
1906–7 . .	1,470,312	14,410	1,484,722
1907–8 . .	1,147,547	4,244	1,151,791
1908–9 . .	845,719	9,265	854,984
1909–10 . .	923,703	6,243	929,946
1910–11 . .	1,089,123	9,353	1,098,476
1911–12 . .	1,455,988	12,178	1,468,166
1912–13 . .	1,643,250	21,417	1,664,667

The Rules and Regulations have recently been translated into French, and are now being translated into German, to meet the convenience of shipbuilders and engineers on the Continent, where a large amount of tonnage is annually constructed

[1] *Report*, 1912-13, p. 4.

in accordance with Lloyd's requirements. There are many interesting facts noted in the current report issued by the Society. Reference is made to the success of the Internal Combustion Marine Engine in certain trades. There are at present twelve sea-going vessels classed with the Society fitted with these engines, and twenty-five others are in course of construction. The increase of tank steamers is also mentioned; no fewer than forty-five vessels measuring over 260,000 tons were classed during the year under review. There is a growing number of steamships of upwards of 5000 tons, to which the 100 A1 class has been assigned, the largest being the Cunard liner *Aquitania* of 48,000 tons, while from a list of ships and tonnage which is given, it is evident that the well-known shipping lines are adopting a vessel of 12,000 to 15,000 tons register.

A little farther on one learns that "the use of Wireless Telegraphy and Submarine Signalling increases year by year. There are now recorded in the Society's Register Book 1932 vessels fitted with Wireless Telegraphic installation as compared with 1392 at a corresponding date last year, and 806 fitted with Submarine signalling apparatus as compared with 630 last year. . . ."

"The certificates of classification of Lloyd's Register are recognised by the authorities of the following countries as exempting vessels from undergoing certain inspections at the hands of the officials to the several Governments, *i.e.* Australia, Austria, Hungary, Canada, Denmark, France, Greece, Norway, Russia, Spain, Sweden, and the United States of America."

One final point deserves mention as exemplifying the many interests now served by this great organisation: the Society's Surveyors undertake the inspection of Cold Storage establishments and advise not only as to their construction and equipment, but are willing to arrange periodical surveys in order that the efficiency of the installation and its working may be permanently guaranteed.

As has been mentioned already, when the Merchant Shipping Bill was before Parliament in the year 1890, the various shipping interests in Glasgow raised a protest against a monopoly in approving and certifying load lines being conferred on Lloyd's Register. This protest led to an amendment being inserted in the Bill, and becoming part of the Act, to the effect that this important duty should be shared by Lloyd's Register and a newly organised Society having its headquarters at Glasgow, now known as the British Corporation for the Survey and Registry of Shipping. This corporation, founded twenty-three years ago, has undoubtedly had a very great effect on shipping developments, notably in structural methods and in types of ships. It would be neither true nor courteous to say that Lloyd's Registry had not kept abreast of the times: it had done and was doing a great work in the interests of shipping. But a new spirit was abroad making possible some noteworthy developments in the art of ship designing and constructing. The advent of the new Corporation gave a great impetus to the new possibilities. But whilst it is true that in Glasgow there were many forces at work forcing the pace, it is equally true that in London the senior Society, representing the shipping interests of the whole kingdom, showed its vitality and greatly increased the elasticity of its methods. This in the first place was accomplished by organising a consultative committee of marine architects and shipbuilders and the manufacturers of structural materials; and finally Lloyd's greatly strengthened its position by incorporating these interests with its existing Committee of Management, which previously had only represented the ship-owning and underwriting community. It has already been described how Lloyd's Register has benefitted by this step. The new society, too, has made very considerable progress, nor can it be regretted that the spice of competition has entered a field where in the national interest it is necessary that Great Britain should hold the premier place.

At this point a digression on the subject of the load line is permissible. During the period when ships were built almost entirely of wood, disasters at sea were, in comparison with to-day, of far too frequent occurrence. This led to many well-intentioned people taking up the subject of loss of life at sea. Chief among the "laymen" interested in this movement was Mr Samuel Plimsoll, who devoted many years to waging a crusade against coffin ships. In doing so he made many serious and general charges against British ship-owners, which for a time startled the nation and caused many inquiries to be made. Fortunately our ship-owners passed through the ordeal practically unscathed. A little exaggeration, however, is supposed to help on an agitation of this nature, and undoubtedly there was more than a little exaggeration in this case. It was alleged that rotten vessels, insured for amounts far beyond their value, were sent to sea with the hope that they would never reach port. It was declared that ship-owners were callous as to loss of life and its attendant sufferings, so long as they made money. The remedies suggested by well-meaning but half-informed philanthropists would have had a disastrous effect on British commerce, and that, too, at the very moment when it was beginning to enter upon a great and far-reaching development. There were some cases where undoubtedly unseaworthy ships were allowed to leave port, and there may have been some callous ship-owners. Every calling has its black sheep; but it was a gross exaggeration to make these serious charges against all ship-owners. It looked at one time as though the Government would accept the statements of the agitators as proved. Happily, however, representations from leading ship-owners had their effect. It was pointed out that shipping, especially shipbuilding, was passing through a rapid stage of transition. That though it was to some extent true that the wooden ship had a bad record, a sounder material was being experimented with, and there was every hope that greater safety at sea would result from the extended use of iron and steel in shipbuilding. The country was reminded that the majority of both shipbuilders and ship-owners were honest, right-minded men, striving to produce and operate a safe vehicle for the purpose of ocean transport. The result of the agitation was not wholly unsatisfactory to either party. The Government did not act in a panic, neither did they leave things altogether to drift. A Royal Commission on unseaworthy ships was appointed to investigate the load line question, it being alleged that the great source of danger was overloading. This Commission reported to Parliament in the year 1874.

In the report the opinion was strongly expressed that reserve buoyancy should form the main guide to a suitable load line, but that an Act of Parliament, framed to enforce any scale of freeboard, would be mischievous, if not impossible, as would any universal rule which professed to provide for the safe-loading of ships. Public opinion, however, was not altogether satisfied, and an Act was passed making the Board of Trade responsible for the detention of overladen ships, and compelled ship-owners to place on both sides of every vessel, amidships, a mark, which, after the leader of the agitation, is known as the *Plimsoll Mark*, showing what in their opinion was the greatest draught to which the ship should be loaded. Taking into consideration the condition of shipping at that time, and the many uncertainties connected with different types of ships, this was probably the best method of commencing a new system, whose great object it was to obtain with scientific accuracy a safe load line. It was quite impossible to get this by a stroke of the pen, there were among the experts of the day too many divergent opinions upon the subject. The onus of fixing the load line was in the first instance placed on the ship-owner, but the Board of Trade was responsible for any overladen British vessel that might be allowed to leave our ports. Needless to say there were many disputes while this state of affairs continued. In the year 1882 Lloyd's Register published, for the benefit of those fixing freeboards, reserve buoyancy tables. Of course they were not enforceable at law, but they had behind them an institution whose influence among the shipping community was very powerful, and whose decisions could not lightly be disregarded. Indeed, within two years the Committee assigned freeboards to no less than 1200 vessels. And so until the year 1890 this important matter stood, ship-owners being for the most part satisfied with the freeboards assigned to their ships by the Committee of Lloyd's Register, guided by Lloyd's Freeboard Tables. These tables underwent modification as experience was accumulated, until they passed entirely from the experimental to the scientific stage. In the year 1890 it was resolved that the load line question should be put upon a more satisfactory basis. Fifteen years before it would have been impolitic for Parliament to have adopted too definite an attitude on so controversial a subject. Now, however, accumulated experience had enormously increased expert knowledge, and it was felt that the whole question might very well become the subject of further legislation. Even so there were divergent opinions, and from the Clyde came a vigorous protest against Lloyd's Tables being made compulsory, and the assignment of load lines becoming the monopoly of one favoured Register. The Load Line Bill had passed the House of Commons, but representatives of the shipping interests of Glasgow came to London, and owing to the sympathetic attitude of the Board of Trade, an amendment to the Bill was drafted, which the Government accepted. Thus when the Bill became law there were three authorities licensed to assign load lines : Lloyd's Register, the British Corporation, and the British Committee of the Bureau Veritas.

The new corporation thus founded has been remarkably successful, and has undoubtedly had its effect in rendering shipbuilding methods more elastic and progressive. Circumstances pointed to the possibility of a compulsory load line leading on to compulsory classification, because the assignment of a load line depends on structural strength and the general character and condition of a given vessel. Thus the British Corporation undertook as one of its early duties the preparation of rules and regulations, embodying the latest results of scientific knowledge and practical experience for the construction of steel vessels. These rules were published in the year 1893, and the shipping community immediately realised that a new era of freedom in ship construction had been inaugurated. Nor can it be questioned that during the past twenty years there has been less conventionality and more individuality in ship construction and design. At first the naturally conservative instincts of shipowners rendered the progress of the new Registry slow, but each year the tonnage built under the new rules steadily increased, until about one-tenth of the new tonnage of the whole world is built under this Corporation. Over 3,000,000 tons have (1913) been built to this classification; last year's work alone amounted to 330,000 tons, and in the spring of this year 415,000 tons was either building or arranged for under the same auspices. Commencing in Glasgow not quite a quarter of a century ago with a staff of five surveyors, this Registry has now on its staff over 150 qualified technical men, stationed in the principal ports of the world to look after the interests of the tonnage entrusted to its care.

It has been mentioned that the Act of 1890 delegated the assignment of load lines to three corporations, the third being the British Committee of the Bureau Veritas. This Registry was established at Antwerp as far back as the year 1828. Its original title was "Bureau de Renseignements pour les Assurances Maritimes." For about a year this Registry contented itself with the publication of monthly tables for the information of marine underwriters. In 1832 its headquarters were transferred permanently to Paris. In common with Lloyd's and the British Corporation, the Bureau Veritas has developed into a great corporation issuing rules for the construction of all kinds of vessels, and its recently published regulations provide for the largest type of ship now built. In consequence of the Act of 1890 it became necessary for the Bureau to increase the importance of its branch in England. This led to the establishment of a Freeboard Committee with headquarters at Liverpool. Six years later, however, the work had developed to such an extent that it became necessary that the principal office should be in London. The British Committee of the Bureau Veritas have thus been settled in London since 1896. The rules of the Bureau for classification are in all essentials identical with those of the British Corporation.

In the report of Lloyd's Registry for the year 1912 it was announced that an agreement had been entered into between the Commission of the Veritas Austro-Ungarico, whereby owners of vessels belonging to the Austrian-Hungarian Mercantile Marine might have the advantage of classification for their vessels with both Societies, on the basis of survey with one organisation only. In the current report (1913) it is noted with satisfaction that this arrangement is working well and is giving satisfaction to Austro-Hungarian shipping, whilst as a development from this, a further arrangement has recently been made with the same Society for the assignment of freeboards to Austro-Hungarian vessels, under ordinances issued by the Austrian and Hungarian Ministers of Commerce. These freeboards will fulfil the requirements of the British regulations. Thus in the three important spheres of classification, registration, and assignment of freeboard, there is every indication that before long there will be international agreements, and these will prove of the greatest benefit to ocean commerce throughout the world.

The general process by which classification and registration are accorded to a given vessel is that in the first instance, when the builder's plans have been drawn, they are submitted to the headquarters of the Registry. If the plans are found satisfactory they are passed, and the work of construction can proceed forthwith. Sometimes, however, modifications are suggested, or explanations are required as to certain points, and some amount of negotiation may be necessary before the plans receive official sanction. The steel of which the ship and boilers are to be constructed is manufactured under survey, and must pass the tests prescribed in the regulations. Fittings, including forgings for various purposes, the anchors, cables, etc., must all be manufactured according to rule and under the inspection of the official surveyors. These officers are found not only at the steel works and forging establishments of the United Kingdom, but also on the Continent and in America. The completed vessel is therefore built and equipped under the direct control of the

Registry, which assigns a class according to the standard of construction. But the work of the Registry is not only concerned with the construction of a vessel, but with her upkeep throughout her career, or at least throughout the period she remains on the Register. Thus there are periodical surveys. There are three special surveys during the first twelve years of a ship's life, one every four years, and each more exacting than the last. These special surveys are technically known as *numbers 1, 2, and 3*. Moreover, should a ship sustain an accident, or require repairs in between these periods, the work must be carried out according to the requirements of the official surveyors. A steamer's boilers are under even more complete supervision, if that be possible. All marine boilers, after being at work six years, must be surveyed at least once a year. For a ship to hold a high class on a recognised Register is thus a proof of her sea-worthiness, and affords to shippers and underwriters alike a guarantee without which it would be difficult indeed to carry on business.

CHAPTER VI

MARINE INSURANCE

Marine Insurance is probably the oldest form of insurance, for it was practised by the ancient Greeks. But they also appear to have had an insurance system to provide against loss when slaves absconded, so that it would be unsafe to say definitely that marine insurance is the senior branch of the business. From the earliest days, apparently, contributions from all parties concerned in shipping were payable in cases of general damage or loss; thus the average system is of very ancient date. The word average is not a fortunate one in this connection. The uninitiated inevitably fall into misapprehension, and give the word its modern English meaning, not realising that the word is here used in a very special sense. It was the Lombards who introduced the practice of insurance into Western Europe, and as a consequence many of the technical terms employed are of Italian origin. The word *Policy* itself is derived from the Italian *Polizza*, and in like manner the word *average* in marine insurance has been introduced into the English language from the Italian, perhaps through the French. The original Italian word is *avaria*, meaning loss by damage; the French word is *avarie*, and has the same meaning; and it is this same meaning that must be attached to the word average when used in the business of marine insurance. Average, as applied to particular and individual losses at sea, with the word particular prefixed to it, merely confuses one unless its technical significance is known. The phrase *particular average* contains a contradiction in itself to the ordinary reader, but when it is explained that average here means simply loss by damage, the phrases so frequently used in marine insurance transactions are seen to have a special meaning. In actual practice they give rise to special rights and responsibilities, where a ship and cargo have suffered damage.

In the earliest sea-laws general average is legislated for, and to-day, in the ordinary marine insurance policy, it is losses incurred under a general average claim that are covered. In the laws of the Rhodians, the oldest known maritime laws, there are several interesting clauses on this subject. For instance—

ARTICLE IX.[1]—"OF LIGHTENING OF SHIPS IN A TEMPEST"

"If a master consult about lightening of a ship, let him enquire of the passengers what money they have in the ship, and a just calculation being made, the money shall pay proportionably towards

[1] *A General Treatise of the Dominion of the Sea, and a Compleat Body of the Sea Laws*, p. 91.

the contribution : and the beds and wearing cloaths and instruments shall likewise be taxed. And if an ejection be made, the master shall not be rated at more than one pound, the pilot and boatswain half a pound, and the mariners three scruples. And if there be servants, or any other persons that are not to part from the ship, they shall be tax'd at three minas ; but if they be to leave the ship, at two minas. And in the same manner shall they contribute, if they are robb'd of money or other things belonging to the mariners in general, by pirates. And if there intervene some private articles of partnership concerning profits, a just computation being made of the ship and everything in it, the partners shall bear their proportion of the contribution to be paid for damages.

Illustration

"This article is the most important of the whole fragment, and treats of lightening of ships in time of a storm, etc., and of the manner in which that is to be done. One may easily imagine, that when a ship is in distress and in danger of sinking the law of nature will oblige the persons that are in her, to use all possible means for their own preservation ; and ships being frequently laden so full, in hopes of fair weather, that in case of a storm they are not well able to live at sea without being disburdened of a part of their lading, it is in that case allowable for the master and company to throw over-board, as much of the lading as is requisite for enabling the ship to bear out against the tempest. Nor does that only happen when ships are overburdened: for frequently they may by stormy weather be reduced to such a pass, that though their lading be not extravagant, it may be necessary to part with some of it; and in that case, if the owner of the goods be in the ship, 'tis positively required first to consult him; and in his absence, the consent of the company is a sufficient warrant for the master to disburden the ship; but the merchant, or his super-cargo, or any other person being present for him, 'tis requisite that such an ejection should not be undertaken without his consent. And thence it became customary, not only amongst the Rhodians and Romans, but generally amongst all other navigators, that the owner of the goods being present, should with his own hand begin to disburden a distressed ship, by throwing something overboard himself; after which the seamen and others were to follow his example, and throw over as much of the lading as might put the ship in a condition to resist the storm.

"And because it seldom happens that the whole lading of a ship belongs to one merchant, it is very justly provided, that the person whose goods are cast overboard, shall not be the only loser, but that the owner of such goods as have been saved, shall contribute toward the loss of those that were thrown overboard. So that even silver, gold and precious stones (though these cannot be well supposed to endanger a ship by their burden) must pay proportionably with other goods; and that not according to their bulk but their value; nor is the owner of the ship at all exempt from paying his proportion according to the value of the ship, because the throwing over of the goods contributes to the common security of the ship, and all that is in it: and as everyone is obliged to bear his proportion of the loss, all endeavour to be as careful as possible to throw over the goods that are least valuable; for otherwise it might happen that the master and mariners out of spite and revenge, might occasion considerable damage to merchants, against whom they might have some private pique. . . .

"When it happens that goods have been thus thrown overboard to lighten a ship, the contribution is made in this manner. In the first place, an account is given only of the prime cost of the goods that are lost, and then an estimation being made of them that are preserved, not according to what they cost, but according to the price that they will probably yield at the port whither the ship is bound; they are all charged in proportion to their value, and must pay accordingly.

"And in the same manner it is ordained to make an equal contribution for damages sustained by rovers and pirates; the good design of which law, is, to excite every individual mariner, and other person of the ship to his duty, to which the consideration and apprehension of his own particular risk, will not a little contribute.

"This article concludes with a very reasonable clause, obliging all persons, though not on shipboard themselves, concerned by partnership in any part of the contribution to be paid out of the ship's cargo, to allow their share of the contribution to be paid out of the goods that are preserved, towards the price of those that are lost; which certainly is very just, since it is not those who are entitled to any share of the profit, should decline to bear their proportion of the loss; except that by some separate agreement, the contrary be provided."

ARTICLE XXXV.[1]—"OF A SHIP LIGHTENING HER BURDEN IN DISTRESS"

"If a ship either having lost her mast by accident, or, it being cut, throws over any of her lading in that distress, all the mariners, merchants, and goods, and what is preserved of the ship, shall be liable to a contribution."

But that average was adjusted in a different manner in ancient days to what it is now, is shown by Article XLIII. of these laws:[2] "If a ship be surprised with a storm, and an ejection be made, or if the sail-arms, masts, rudder, anchors, or ship-boats be broken, all that is preserved of the ship and goods shall contribute towards the damage."

Under modern practice the sacrifice must be voluntary and intentional, for if a ship be dismasted by a storm it will be a case of particular average, but if the captain cuts away the mast to save the

[1] *A General Treatise of the Dominion of the Sea, and a Compleat Body of the Sea Laws*, p. 107. [2] *Ibid.*, p. 111.

rest of the ship and cargo, then it is a case of general average, and all concerned in the venture must contribute to the loss.

Owing to the conditions peculiar to ocean transport, marine insurance has many specially interesting features differentiating it, not only from other kinds of insurance, but from all other branches of business. In the days when news travelled slowly, and when the doings of captains and supercargoes at the other side of the world were not easy to control, there were many opportunities for making questionable profits out of a marine insurance policy at the expense of the underwriters. This was true not only of the ship, but also of the goods transported to a great distance. Thus as the business of marine insurance developed, it was clearly laid down that the essence of the business was that absolute good faith should exist between all parties concerned. It is not too much to say that to-day with all the possibilities for getting direct information quickly, good faith still remains the main and essential feature of marine insurance. A contract of marine insurance is in law a contract of indemnity to protect the insurer against loss, it is not a transaction by means of which the insurer may make a profit. Thus in the case of claim where a fraudulent overvaluation has been made, and it is proved that it is so, the policy is rendered void, nor can the insurer recover anything, not even the true value of the interest.

Where there has been shipwreck or collision entailing a claim on the underwriters, the question of average immediately arises. What amount, if any, of the loss is general average, what claims are merely particular average? These questions require the services of a specially qualified man, skilled in insurance business and its technicalities, and he is known as an Average Stater or Average Adjuster. It is the duty of the Average Stater to prepare a statement of the averages, preparatory to their adjustment by the underwriters. These statements are frequently of a very complicated nature, and their preparation requires not only skill, but experience and very varied knowledge. The question of average is raised by the memorandum which is printed at the foot of every marine insurance policy. This memorandum reads—

"*N.B.*—Corn, Fish, Salt, Fruit, Flour, and Seed are warranted free from Average, unless general, or the Ship be stranded; Sugar, Tobacco, Hemp, Flax, Hides and Skins are warranted free from Average under Five Pounds per cent.; and all other Goods, also the Ship and Freight, are warranted free from Average under Three Pounds per cent., unless general, or the Ship be stranded."

All the commodities here enumerated, it will be noted, are peculiarly liable to damage. In consequence of this the underwriters decline to insure the first six on the list against particular average; on the following six a claim will only be paid in cases where the damage sustained amounts to 5 per cent. or upwards of the insured sum. On the remaining goods named, and on the ship herself and the freight, the limit is three per cent.

The theory of General Average hinges on the conception of a ship and her cargo being one venture. This is a survival from old times, as has already been described. A number of people take part in a venture, some supply the ship, others load her with goods; ship and goods are a venture in which there are peculiar possibilities of damage and loss. It may happen that by the sacrifice of one part of the venture, the remainder may be wholly or partially saved, in such cases it is clearly just that, putting the question of insurance on one side for a moment, all who benefit should contribute towards making good the loss to the owner of the goods and equipment which have been voluntarily sacrificed for the common benefit. The sacrifice, however, as has already been indicated, must be intentional and voluntary, for if the loss of a certain part of a ship or cargo saves the venture, and that loss was not due to the act of man, then the loss is a particular loss and remains where it fell. That is to say, in a case of particular average there is no claim on the other parties to the venture. Thus General Average may be defined as a proportionate contribution levied on the ship-owner, on the amount of the freight, and on the owners of the cargo, to indemnify the party who has incurred loss, when either part of the ship or a part of the cargo has been voluntarily or intentionally sacrificed for the definite purpose of securing the safety of the other parts of the venture.

Whilst Particular Average includes losses incurred when partial damage has been sustained by ship or cargo from the common perils of the sea, which have not involved the general safety; these losses *rest where they fall.*

As may easily be imagined many intricate questions arise in connection with claims under a marine insurance policy, for it is general average claims that are covered by the ordinary policy. For instance a case came before the courts in which, during war time, a trading vessel was chased by a man-of-war belonging to the enemy. As night came on it was evident that the chances of escape were small; but the Captain, being a man of resource, as soon as it was dark, lowered one of his boats, in which a mast was stepped, to the head of which a mast-head light was secured. The boat thus lighted was allowed to drift, whilst every light on board the ship was extinguished, and her course changed. The man-of-war, deceived by the light, followed the boat, and the ship escaped capture. It was rightly decided that the Captain had intentionally and voluntarily sacrificed a part of the venture—to wit the boat with its mast and lamp—to save the rest, and therefore the loss was a general average.

If a ship be carrying deck cargo, and the sea wash all or some of it overboard, it is a case of particular average, and the loss falls on the owners of that cargo alone. But if the Captain of the ship order deck cargo to be jettisoned in order to lighten the ship, and thereby saves her, the act, being voluntary and intentional, makes the loss a general average, and all interested parties must contribute proportionally to make up the loss. Naturally the owner of the lost property in a case of general average is responsible for his proportionate contribution, otherwise he would be better off than the other members of the venture. Thus in a case where there is a general average amounting to ten per cent. of the total value of the venture, a shipper of goods to the value of £1000 will have to contribute £100, whilst the owner of £1000 worth of jettisoned goods, will also have to contribute his £100. Otherwise the latter would receive his loss in full whilst other participants in the venture would lose ten per cent. of the value of their respective interests.

The great centre of marine insurance in the twentieth century is London. And this, considering the special features of the business, is a high tribute to the integrity and fair dealing of English underwriters. London rates, and the opinions and willingness of the underwriters at the Royal Exchange, are the determining factors in the business throughout the world. The Americans have an enormous tonnage on their rivers and lakes carrying vast quantities of corn and minerals; nominally that shipping is insured in the States, really it is to London that the underwriters of America look. The same thing is true of insurances effected at Hamburg or Paris, Glasgow or Liverpool. The opinion of members of Lloyd's and their willingness to share the risks is the dominating factor in fixing rates. But of recent years great changes have come over the conditions of insurance business, and the near future gives promise of equally drastic changes.

The era of the big ship has very vitally affected underwriters. Whilst ships were comparatively small, although the margin of safety at sea was lower, the risks were computable and rates were based on experience. Improvements in the construction and equipment of ships undoubtedly gave greater safety, and insurance rates were lowered. Thus Sir John Glover,[1] in a paper read before the Royal Statistical Society at the beginning of the year 1902, was able to exhibit tables of rates of premiums by the best vessels, which showed that between 1880 and 1900 the rates on specie had decreased on an average no less than 57 per cent., on goods shipped by steamers the decrease had averaged 36 per cent., although on goods shipped by sailing ships there had been a small average rise of 3½ per cent. The important point to notice is the very considerable fall in steamer rates, for it is the steamer that has increased so greatly in dimensions during the past decade or so, as a consequence of which, the total value represented by a modern steamer and her cargo may be a figure that would have staggered the underwriters of a few generations back.

It may be that underwriters were unduly opti-

[1] *Cf. Journal of Royal Statistical Society*, vol. lxv., part i., March 31st, 1901.

mistic; at all events, they appear to have decided that a modern vessel, constructed to the highest requirements, ran but slight risk of total loss. But during the last couple of years there has come a very unpleasant awakening. The *Delhi* and the *Titanic* were bad losses, practically unexpected by those who had underwritten the risks. The rate [1] quoted for both the *Titanic* and the *Olympic* was fifteen shillings per cent. net to pay all claims in excess of £150,000. The reconstructed *Olympic* is said to be covered to pay all claims in excess of £300,000 and the rate is thirty shillings per cent., which shows that the Marine Insurance Market has taken a new view as to the impossibility of a serious accident to these large steamers. The year 1912 produced a black record for underwriters, showing the inadequacy of the rates of premiums fixed for first-class risks, nor is it likely that in the future, rates similar to those quoted two years ago, will be available for many a year to come. Not only has the amount of the risk in one bottom very greatly increased, but the cost of repairs, owing to the increased cost both of labour and material, has gone up, and the values of goods insured during transport are higher now than during past years. All these points taken together are having a very marked effect upon the market. Moreover, at the present moment there is the possibility of a revolution in ocean routes and shipping practice caused by the opening of the Panama Canal. It may very

[1] *Cf. Shipping World*, Jan. 15, 1913, p. 126.

well be that advantage[1] will be taken of the opening of a new epoch in shipping business to remodel marine insurance practice in all trades.

The following extract from a British newspaper published early in 1913 is of interest, as showing some of the uncertainties of the amount that can be claimed in cases of total loss:—

"Claims for over a million have already been filed in the American Courts against the Oceanic Steam Navigation Company for the loss of life and property caused by the foundering last April of the White Star Liner *Titanic*, but the situation is so complicated that it is considered likely that litigation will extend over several years. The most important question for decision is whether the British or United States law will govern the proceedings. According to our Merchant Shipping Acts, the liability of ship-owners is limited where the accident is due to negligence, but where it is 'without the fault or privity' of the Company, to £15 per net registered ton for loss of life, and to £8 for loss of goods, so that the White Star Line might be responsible for a sum not far short of the million claimed. If, however, the American statutes are held to apply, the owners are not liable for more than £20,000, the amount of the prepaid freight and passage money, together with the value of fourteen lifeboats recovered."

It is worthy of note that losses by underwriters of specie are very seldom heavy. If a steamer

[1] *Cf. Fairplay*, Dec. 20, 1912, p. 994.

sinks in mid-ocean, as did the *Titanic*, the loss is complete, but this is an exceptional experience. When the *Oceana* was sunk off Eastbourne, she had no less than £750,000 worth of specie on board, but the Salvage Companies carry out their operations with such remarkable success that in cases like this the loss is almost negligible. For instance the whole of the specie on board the *Oceana* was recovered at a cost of less than 5 per cent. of its value.

It need hardly be said that besides the underwriters at Lloyd's there are Marine Insurance Companies doing a very great amount of underwriting. And it is a characteristic of modern business practice that amalgamation is progressing among these companies. This policy is doubtless assisted by the facts to which reference has already been made—notably the much heavier values included in one venture. Last year, even before the loss of the *Titanic* and *Delhi*, the absorption of Marine Insurance Companies by the larger Fire Insurance Companies was noted as "*continuing*."[1] During the year 1911 the shares of the Union Marine Company were bought by the Phœnix Fire Office, and the Liverpool, London and Globe Company made a somewhat similar deal in taking over the Thames and Mersey Company, whilst the announcement was made that an arrangement had been entered into by the Directors of the World

[1] *Cf. The Economist*, April 26, 1913, pp. 978-80. (This Article gives an interesting account of the reports of nine Marine Insurance Companies.)

Marine Insurance Company to buy the shares of the London and Provincial Marine and General Company; and the British Dominions General Insurance Company purchased the shares of the Commonwealth Insurance Company of Melbourne. Lloyd's itself, the same year, succeeded in getting a Bill brought before Parliament, the main object of which was to remove the limitations under the Act of 1871, which restricted the operations of the Society to marine insurance. All these changes point to the tendency so observable in modern business, notably in banking, namely consolidation of interests, and amalgamations by means of which increased business, under conditions of greater security, can be undertaken.

The thorny subject of war risks is rather beyond the scope of this essay, but a recent very remarkable development[1] which has originated at Liverpool is well worthy of note. A new mutual insurance association has been formed with Sir Norman Hill as Manager and Secretary. The object of this new undertaking is to cover war risks. As these lines are being written, the membership includes the management of about 433 vessels with a value of somewhere about £29,000,000; and there is a probability that all the great passenger lines will eventually join. The present scheme is to insure war risks only when Great Britain is neutral, and so cover the risks of members until their ships arrive in a safe port after a war has been declared.

[1] *Cf. Shipping World*, May 25, 1913, pp. 547-8.

In the event of a ship entering a neutral port she will be covered for a period of ten days after arrival, or should the port cease to be neutral during that time, she would be covered until arriving at some really safe port. The scheme does not contemplate covering any risks that would arise after this country is at war with another nation; "this is too comprehensive a subject and only the nation under circumstances, as they arise, can possibly undertake to deal with it." It is interesting to notice that the new Association will encourage adherence to the interpretation placed upon the Declaration of London by the English Courts, and that should an unreasonable interpretation be taken by any belligerent Power, a member whose vessel might be seized would not be prejudiced, but would be held to be covered by the Association.

CHAPTER VII

STATE REGULATION—THE SHIPPING ACTS

UNTIL the year 1825 British Shipping was principally regulated by the Navigation Act, originally passed in the time of Cromwell, and confirmed by the Restoration Parliament. This Act was the consummation of a policy which had been more or less steadily pursued by the English Government, with the object of fostering shipping, since the time of Richard the Second. It was indeed one of the principal features of the Mercantile System, or Policy of Power, which reached its highest point under Cromwell. The policy, as a whole, was discredited by economists, although Adam Smith wrote with approval of the Navigation Law.

In the year 1825, the Navigation Act and all other Acts regulating British Shipping were repealed, and a new system was introduced; but it should be noted that the Law of 1825 continued the policy of fostering our shipping as had been the rule under the previous Navigation Act. Just after the accession of Queen Victoria, our fiscal policy began to be revolutionised, and, under the influence of free trade doctrines, the policy of Great Britain as to the regulation of shipping was fundamentally altered.

Finally, the last vestiges of the system of restriction were removed from the Statute Book, with the exception that the trade from any one part of any British possession in Asia, Africa and America to another part of the same possession, could only be carried on in British ships. This is still the law, but the Crown has the power by order in Council, on petition from the legislature of any such possession, to relax this regulation. Otherwise foreign shipping may enjoy free commercial intercourse, on terms of equality with British ships, with the United Kingdom, even being permitted to take part in the coasting trade, and with all parts of the Empire, with the above noted exception, with a possibility, however, of confining this intercourse to such nations as consent on their part to concede a reciprocal and equal freedom to British shipping. "For, by the 16 & 17 Vict., c. 107, ss. 324-326,[1] it was enacted, that if British vessels were subjected in any foreign country to any prohibitions or restrictions as to the voyages in which they might engage, or the articles which they might import or export, her Majesty might, by order in Council, impose corresponding prohibitions and restrictions upon the ships of such foreign countries; and further, that if British ships were directly or indirectly subjected in any foreign country to duties or charges from which the national vessels of such country were exempt, or if any duties were imposed there upon articles imported or exported in British ships,

[1] *Cf. Stephen's Commentaries*, vol. iii., pp. 155-156.

which were not equally imposed upon the like articles in national vessels; or if any preference whatsoever were shown, either directly or indirectly, to vessels of such country over British vessels, or to articles imported or exported in the former, over the like articles imported or exported in the latter; or if British trade and navigation were not placed by such foreign country on as advantageous a footing as the trade and navigation of the most favoured nation, then, and in any of these cases, her Majesty might, by order in council, impose such duties of tonnage upon the ships of such foreign nation, or such duties on goods imported or exported in its ships, as would countervail the disadvantages to which British trade or navigation was subjected. And these provisions still remain substantially in force, notwithstanding that the Act 16 & 17 Vict., c. 107, has been now in great part repealed."

In the year 1894 the whole of the Shipping Act then in operation was consolidated and extended in the Merchant Shipping Act[1] of that year. Since 1894 this Act has been amended or added to as occasion has arisen, the most important Act being that of 1906.[2] The Board of Trade is the authority charged with the administration of these Acts, and as has been made clear during the past twelve months, this duty is by no means a sinecure.

[1] For a convenient digest of the Acts see the *Shipping World Year Book* for 1913, pp. 69-175.

[2] *Cf.* Appendix No. 14. Lindsay, *History of Merchant Shipping*, vol. iii. p. 634, gives a list of Acts and Parliamentary Papers affecting British Shipping between 1849 and 1875.

What developed into the Board of Trade was established in the first instance by Oliver Cromwell as a department to foster trade and navigation and check the growing shipping activities of the Dutch. Such valuable work had been accomplished by this department that the policy was continued by the Restoration Government, which in its very first year (1660) appointed a Committee of the Privy Council, with the object of ascertaining particulars of the import and export trade of the country, and to suggest how trade generally might be improved. Shortly after this another and similar committee was set up to foster Colonial interests. And in the year 1672 an amalgamation of these two committees was arranged. This new body was known as the Standing Council of Trade and Plantations.

The expectations of the founders of this committee were disappointed, for it only existed two years. It was, however, revived in the year 1696, and then continued as a Standing Committee for the greater part of a century. In 1782 it was abolished, and there was nothing to take its place for four years. Then (1786) the Department was re-established by an Order in Council, when it was organised as a Permanent Committee of the Privy Council for the consideration of all matters relating to Trade and the Colonies. For sixty-eight years these two great interests of the Empire remained under one department. But in the year 1854 the Colonial Office was established as a separate department, to take exclusive charge of Colonial business.

The present duties of the Board of Trade include the collection and publication of statistics as to trade; the control and issue of Patents and Trade Marks; the preservation of the standards of weights and measures; the supervision of the non-legal machinery as to bankruptcy; the registration of Joint Stock Companies; control of railway, tramway, water, gas and electric lighting companies; and merchant shipping, harbours and lighthouses. In connection with the last named, it acts as auditor of the Trinity House accounts. This bald list shows the enormous interests now controlled by this one Department, and from it can be realised the reason for the suggestion that there should be a reconstruction of the Department, and the establishment of a Ministry of Commerce under a Cabinet Minister, who would be able to give undivided attention to matters of such vital importance to a great commercial and industrial country.

It is the responsibility of the Board of Trade in connection with shipping that has here to be considered. The Board is charged with a number of very important duties connected with the ship, her officers, crew, cargo and equipment, and if she be a passenger ship there is an even greater responsibility, necessitating a special organisation for safeguarding life at sea. The following are some of the principal matters dealt with by the Marine Department of the Board of Trade and by the officers responsible to the Department:—

Registry of ships, tonnage measurement of ships.

Survey of ships, and ships' equipments and life-saving appliances.

Grain cargoes, timber cargoes, carriage of dangerous goods.

Seaworthiness of ships, overloading, under-manning.

Emigrant ships.

Examination and certification of ships' officers.

Supervision of the engagement, discharge and payment of seamen.

Protection of seamen from crimps, and transmission of seamen's wages.

Repatriation of seamen discharged abroad, and relief of distressed seamen.

Inspection of provisions, certificated cooks.

Language test for seamen, continuous discharge books, failure to join ships, desertion.

Health of seamen, medicine chests, medical guide.

Wrecks and casualties, rocket life-saving apparatus, rewards for saving life.

Inquiries into wrecks, casualties, misconduct of officers, deaths at sea.

Naval Courts.

Inquiries into boiler explosions on land and sea.

Testing of anchors and chain cables.

International conventions for the unification of maritime law.

International conventions for regulating fisheries and fishing vessels.

International regulations for preventing collisions at sea.

International code of signals.

Questions of foreign and colonial shipping legislation, subsidies and bounties, shipping rings, and miscellaneous shipping questions.

In addition to the statute law relating to merchant shipping which is enforced by the Marine Department of the Board of Trade and its officers, there is a large body of statutory rules and regulations, Orders in Council, and Departmental Orders made under the Merchant Shipping Acts for the regulation and control of merchant shipping. These regulations are supplemented by instructions issued by the Marine Department for the guidance of its officers in carrying out their duties under the Merchant Shipping Acts and other Acts.[1]

Finally, although the Trinity House, which dates back to the reign of King John, and had many privileges conferred upon it by Henry VIII., still has charge of the lighting and buoying of the coast and channels of England and Wales, it has been controlled financially by the Board of Trade since 1853. From the year 1854 the Trinity House, under the Merchant Shipping Acts of that year and subsequently, has been responsible for removing wrecks which may be dangerous to navigation, and is charged with the appointment and licensing of

[1] *Cf. A List of the Principal Acts of Parliament, Regulations, Orders, Instructions, and Notices relating to Merchant Shipping.*

pilots [1] at several ports. Thus the connection of the Board of Trade with shipping is very complete, and its control and responsibility have increased considerably, more especially of recent years.

It would be beyond the scope of this book to give a detailed account of all the points of contact between the Board of Trade and Shipping. The important subjects of Registry and the Load Line have already received attention, and there are a few important subjects which require some further treatment. This must not, however, be understood as suggesting that the other points are not important, indeed some of them are of very great moment, but require the skill of the technical expert to explain them.

In the year 1850, just after the repeal of the Navigation Act, "An Act for improving the conditions of Masters, Mates, and Seamen, and maintaining Discipline in the Merchant Service" was passed. This Act may be considered as marking the commencement of a new era in British Shipping. It instituted Marine Boards at the principal seaports, whose chief duties should be the granting of certificates of efficiency to ships' officers after examination, and the establishment of shipping offices where seamen should be engaged and discharged. This Act also provided for the proper housing and feeding of the sailor at sea, and made obligatory the keeping of an Official Log Book. Thus since 1851, when

[1] *Cf. Report of Departmental Committee on Pilotage*, 1911, Cd. 5571, p. 7.

this Act came into force, the senior officers responsible for the navigation of a British ship must hold certificates of efficiency. Later on this was extended to the engine-room staff. These certificates are granted after examination by the Board of Trade. For deck officers there are now three necessary examinations and one extra, *i.e.* second mate, first mate, master, and extra master. There is also an examination for only mate.[1] For engineers there are only two necessary examinations and one extra, *i.e.* second engineer, chief engineer, and chief engineer extra. In the British service a candidate for a second mate's certificate must be not less than seventeen years of age, and must have served four years at sea. The examination consists of two parts, navigation and seamanship. The latter is *viva voce*, and is a very practical test. If the candidate fail in this he will not be examined for at least six months: whether the whole or part of this period be served at sea is left to the discretion of the examiner. Failure to pass in navigation only entails a delay of three months, during which the candidate may remain ashore, and prepare himself at a navigation school.

Having secured a second mate's certificate, an officer must serve at least a year at sea before presenting himself for the first mate's examination, and must serve a further two years at sea before taking the master's examination.[2] Of recent years

[1] For the service required *cf.* Appendix 15.

[2] For full details *cf.* Appendix 15.

a necessary modification has been made in the regulations. It is practically the rule that an officer of a steamer of any size shall hold a certificate of a rank superior to that which he actually fills, *i.e.* even a second mate will usually be furnished with a master's certificate, and almost always with a first mate's. Hence, now, an officer who has served two years as second mate, and has passed the examination for first mate, is allowed to sit for the master's examination, even though he have never held the position of first mate.

In the case of engineer officers, after apprenticeship, or its equivalent, for at least four years in a marine engine works, where a young fellow has the opportunity of making himself familiar with everything connected with the marine engine; passing through the drawing office where the machines are designed, the pattern shop, and the foundry, the smithy, the fitting and erecting shops, where the various parts are cast or forged and fitted, and so mastering the mysteries of engine construction; he gets a berth for at least one year in a sea-going steamer. There he will get his practical knowledge of marine engine working, nor is this by any means child's play, for the engineers have not only very responsible and very heavy work, but a position in the ship of more than ordinary danger. Many an act of heroism unrecorded, but worthy of the greatest honour, has been unostentatiously performed in the engine and boiler rooms of our steamers; indeed the conditions under which the work is carried on are such that this must continue to be so. After practical experience of the work of an engine room, the candidate, if not less than twenty years of age, will be admitted to the examination for the certificate of second-class engineer. He may sit for the examination for a first-class engineer's certificate after serving one year as second engineer. The qualifications required for an Extra First-Class Certificate are the possession of a First-Class Engineer's Certificate, and having served at least five years' apprenticeship, or three years' apprenticeship and three years in an approved technical school, or having served for one year at sea on regular watch on the main engines or boilers as senior engineer in charge of the whole of the watch, while holding a First-Class Engineer's Certificate.

Not only, however, is the Board of Trade responsible for the skill of captain and engineer, but it is charged with looking after the well-being of sailor and fireman while afloat, and partially at any rate, during their stay ashore. In the bad old days sailors were a prey to crimps and a variety of bad characters. After a long voyage a seaman might be paid off with quite a considerable sum of money, but generally speaking, however much it might be, a few days *spree* found him penniless. Hence the regulations protecting sailors from crimps, and the admirable arrangements [1] made for the safe-keeping and transmission of a sailor's earnings by the shipping masters.

[1] *Cf.* Merchant Shipping Act, 1894, §§ 145 to 154.

The signing on and discharging of a crew must now take place at a Marine Office and under the eye of a Board of Trade official. Things may not be all that could be wished for even yet, but the careful man has now a chance to husband his earnings, formerly he had practically none at all. The efforts of the Board of Trade, supplemented by well-organised Sailors' Homes and Missions, have done splendid work in improving the lot of the sailor.

The seafarer whose circumstances have yet to be improved is the fireman. The conditions of his life are, in many steamers, such that one can but hope for the success of oil fuel or the internal combustion engine, as offering the only hope for the amelioration of a type of existence which, in far too many instances, can only be described as unhuman. And yet these men will work on occasion as only Englishmen can. But the heat and the hardness of the life, and the condition of some ships' bunkers and stokeholds, are such, that it cannot be wondered at, that many of these men drink hard and lead a hideous existence.

The Board of Trade is responsible for seeing that both seamen and firemen are adequately lodged and fed. The housing, however, varies enormously between ship and ship, and even in some large vessels is none too adequate. The recent legislation passed by the Australian Commonwealth Parliament errs perhaps on the grandmotherly side, but between the two sets of regulations there is a mean which would greatly improve the sailor's lot. The British

Shipping Acts only require one-eighth of the cubic space, and one-fifth of the deck space for each man, of that laid down by the War Office as the minimum for barrack accommodation. There are of course differences between shore and sea life, but hardly so much as is here indicated. To prove that efforts have been made to make the sailors' quarters comfortable, and that all ships are not alike in this respect, the *Syren and Shipping* for November 5th, 1913, gives a plan of the crew's quarters on board the *British Monarch*, showing that each man has plenty of light, air and space, that the mess rooms and sleeping quarters are separate, and that ample locker and bath accommodation is provided.

A very interesting report was recently issued by the Port Sanitary Authority at Newport, Monmouth. In this the Medical Officer of Health pointed out that during the year 1912 no less than 15·9 per cent. of the vessels inspected in the port were found to be insanitary; and that over a period of fifteen years the lowest percentage had been 11·9, whilst the highest had been 18·8. Nor were the offending vessels all under a foreign flag. The cleanest ships were Danish, the dirtiest Portuguese, British came about half-way between the extremes, but doubtless exceeded all other nationalities very considerably in number and tonnage. The report declares that the Board of Trade Regulations are inadequate for securing the needful cleanliness in sailors' sleeping quarters, and sanitary arrangements. Special attention is drawn to the indifferent lighting and ventilation of the average forecastle. The causes of the insanitary conditions remarked upon are stated to be, lack of supervision on the part of officers in not seeing that the men's quarters are kept efficiently clean, the unclean habits of some of the men themselves, and the mixing in common quarters of men of very different habits and nationalities. It is disturbing to be told that "the best and most comfortable conditions are to be found chiefly in foreign owned ships with a few exceptions."

The chief type of ship calling at Newport is the tramp, but after making all possible allowances, there appears to be something here calling for re-adjustment.

So far as food is concerned the scale of diet is carefully prescribed, and indeed the living on board ship leaves, for the most part, but little to be desired. In case of sickness or accident at sea, medicines, appliances and instruments have to be carried according to a carefully constructed scale,[1] suited to the needs of passenger, emigrant and cargo vessels.

The accidents that from time to time occur to passenger vessels keep the general public in touch with the responsibilities of the Board of Trade for those travelling by sea in British ships. English passenger ships have been subject to special survey regulations for over a century. The first separate Act on the subject was passed in the year 1802; but it was the rush of emigrants to Australia and

[1] *Cf.* Merchant Shipping Act, 1894, Part III., revised in January 1912; *Shipping World Year Book*, 1913, pp. 101-112.

America about the middle of last century that drew special attention to the need for carefully regulating all passenger, but especially emigrant, ships. Between the years 1846 and 1854 no fewer than two and a half million persons emigrated from the United Kingdom. This rush to get to a new country, financed to a great extent by successful relatives who had gone before and prospered, and were wishful that kin remaining in the old country should have a new chance, led to the employment as passenger carriers of a large number of ships. Among these were some that were quite unsuited either by construction or age for the purpose. In seven years, sixty-one ships carrying passengers were wrecked, involving the loss of nearly sixteen hundred lives. This serious loss of life compelled Parliament to consider the whole question of official responsibility for loss of life at sea. From the inquiries then made, and by subsequent experience, it has been established that for the due regulation of an emigrant service, in addition to the suitability and seaworthiness of the ship, rules must be drawn up as to the space allotted to each individual, together with careful regulation as to decency, ventilation and sanitation; the diet must be prescribed and its quality sampled; medical attendance and medical comforts must be provided in due proportion; whilst there must be adequate medical inspection before embarkation. These, together with other necessary points as to the ship and her equipment, are now all laid down by Board of Trade regulation, and there is an efficient staff of officials to see that these regulations are adequately enforced.

But in addition to the emigrant ship and her equipment being under strict regulations, from the early days of emigration it was found that the too trustful emigrant must be protected from bogus agencies, decoys and runners. Nor was this neglected by the authorities, for at the present moment, and for many years past, so far as is humanly possible, the emigrant has been protected from the many traps and pitfalls which befall the unwary and guileless when he finds himself in a strange place, engaged in a novel undertaking. The first and second class passenger can look well after himself. It indeed behoves the State to survey the vessel that is permitted to ply with passengers, and dictate what equipment for the purpose of life-saving shall be carried, but when rules have been prescribed for safety of life at sea, it is found that ordinary commercial competition brings about a survival and continuance of the fittest, *i.e.* the well-organised lines are their own advertisement.

Safety of life at sea both for passengers and crews may depend very vitally on what cargo is carried, how it is stowed, to what depth a ship may be loaded, and when deck cargo may be carried. All these are subject to Board of Trade control. Even now, from time to time, there are questionings as to the wisdom of official regulations. Indeed, the novel[1] with a purpose has been written on the subject.

[1] *Cf. The Grain Carriers*, by Edward Noble.

But in spite of many grumblings and much criticism, the Board of Trade has, on the whole, performed its duty well; and thanks, perhaps, to the spur of public opinion, has kept itself well abreast of the times. An event like the loss of the *Titanic* comes as a great shock to the public conscience, and necessitates a very considerable jettisoning of old ideas. It is discovered that the question of boats for all has not been in the official mind; probably the conviction that the unsinkable ship had been constructed had lessened the belief in the utility of boats. In fact it is only very occasionally that boats, even though needed, can be used to advantage, as was witnessed in the case of the *Volturno*, which was destroyed by fire in mid-Atlantic during heavy weather on October 9th, 1913. It is of very rare occurrence that a vessel founders on a fine still night, giving the opportunity to lower every available boat. The critics of extraordinary occurrences usually forget many essential points, especially in a case like the *Titanic*; but one sometimes wonders, when quietly reviewing the situation, how a great State Department can be kept so well abreast of the times as the Board of Trade usually proves itself. It is doubtless due to the fact that successive Presidents have not been too proud to gather experience from those best fitted to impart it—namely, the leaders of the shipping community.

It has already been mentioned that the Board of Trade has control over the Trinity House, whose principal duties are the lighting of the coast, the lighting and buoying of channels, the clearing of wrecks when causing obstruction, and pilotage. The London Trinity House consists of a Master, Deputy-Master, twenty-three Elder Brethren (ten of whom are acting, and thirteen honorary) and an unlimited number of Younger Brethren. The Deputy-Master and the acting Elder Brethren must have held the rank of Commander in the Navy for at least four years, or if in the Merchant Service, must have held command of a vessel for a similar period. The Younger Brethren all belong either to the Navy or to the Merchant Service, and are admitted by the Court of the Elder Brethren. Two Elder Brethren of the Trinity House assist when shipping cases concerning loss or collision are heard before the Admiralty Court. They have no judicial authority, but are present as advisers. As to pilotage, a departmental committee was appointed in July 1909, and presented a report in 1911 which has resulted in the passing of the recent Pilotage Act. To obtain some idea of the state in which pilotage regulations have existed down to the present day, this report should be read. But it must not be thought, that because, as in so many things English, there is no apparent system or method, that therefore our pilotage arrangements have been inefficient. The pilots of the United Kingdom are a fine body of men, and the work goes on well not because, but in spite of the *system*. The recent Act, however, will doubtless put things on a better basis, and while introducing order and method, will do away with many irritating anomalies.

It was found by the committee that so far as pilotage is concerned, there are many unnecessary complications. For the United Kingdom as a whole, there were no fewer than 116 Pilotage Authorities, of whom 40 had never exercised, or had ceased to exercise, their functions. The committee reported that "the organisations of the present day consist of the Board of Trade as the Central Authority; the Trinity Houses of London, Newcastle, Hull and Leith, established by Royal Charter, and having power confirmed by statute, each controlling a large district comprising several ports; and the various local authorities, whose powers in many cases rest largely on local statutes."

The London Trinity House, or to give it the full official title, the Trinity House of Deptford Strond, is the most important of all the existing Trinity Houses. So far as its public duties are concerned it exercises them as two distinct authorities, the one being for the London district, and the other for a number of the outports, and both of these are constituted differently. The London district extends roughly from Orfordness to Dungeness, and here the constitution of the Trinity House as Pilotage Authority[1] resembles that of the ordinary Pilotage Boards, Trusts or Commissions; there being a committee of control consisting of four Elder Brethren of the Trinity House, and one

[1] *Cf.* Report, p. 19.

representative each appointed by ship-owners and pilots. In the second capacity mentioned, the London Trinity House has control of thirty-five outports. These ports vary in size and importance from Aberdovey, where the annual earnings of each pilot average about £7, to the Isle of Wight district, where the number of ships piloted is very much greater, and the average annual earnings of each pilot amount to about £274. These outports are controlled by a committee of the Trinity House, consisting of the same four Elder Brethren as serve on the London district, but having no representatives of ship-owners and pilots. At the outports in some cases there are Sub-Commissioners, three or five in number, but no representatives of ship-owners or pilots, whose duties under the Merchant Shipping Act, 1894, are the examining of candidates for licenses. It is unnecessary to go into the constitution of other Pilotage Authorities, such as the Mersey Docks and Harbour Board, the next most important to the London Trinity House.

Under the new Act which became law on the 7th of March 1913, and came into force on the 1st of April following (with an exception to be noted later) the Board of Trade is definitely the chief Pilotage Authority. The Act has been passed with the intention of simplifying, and ultimately making uniform the whole of the law regulating pilotage in this country. It is hoped moreover that, by means of international agreements, there may eventually be uniformity of law and regulation on the subject of pilotage throughout the commercial world. The most interesting sections of the Act are clauses 14 and 15, which deal with the abolition of the defence of "compulsory pilotage." The Act is very comprehensive, and is based on the report issued by the Departmental Committee to which reference has already been made.

The new powers conferred on the Board of Trade make the Board the authority to alter the regulations or customs of any port in order that uniformity of practice may prevail throughout the United Kingdom, and that the exact nature of the law may be easily accessible to all. The Board may also make such rearrangements of pilotage districts as it may deem either necessary or expedient. It may establish new pilotage districts, abolish those now existing, and define the limits of districts. It may make provision for the direct representation of ship-owners or pilots on any pilotage authority, and it may compensate pilots whose interests have been affected by the changes introduced. This appears to place an enormous power in the hands of the Board, but, in order to prevent any possible abuse of that power, a pilotage order issued by the Board shall require confirmation by Parliament (*a*) if it is an order made for any of the purposes of Part I of the Act, *i.e.* making drastic alterations; or (*b*) if a petition be presented to the Board against the order by any person who appears to the Board to be an interested party; this petition must be presented within six weeks of the publication of the order.

As to the abolition of the defence of "compulsory pilotage" in the event of a vessel under compulsory pilotage causing damage to dock, wharf, or craft, section 15 of the Act reads thus—"Notwithstanding anything in any public or local Act, the owner or master of a vessel navigating under circumstances in which pilotage is compulsory, shall be answerable for any loss or damage caused by the vessel or by any fault of the navigation of the vessel in the same manner as he would if pilotage were not compulsory." This section will not come into force until the first of January 1918.

So far as the Trinity House is concerned, its duties remain practically unchanged, but the Board of Trade is definitely the responsible authority, and as a consequence, it is hoped, that in course of time, many anomalies and anachronisms will cease to exist, and that the pilotage system as a whole will be modernised and co-ordinated in its organisation.

The duties of the Trinity House connected with the lighting of the coast, and the lighting and buoying of channels, are shared with the Commissioners of Northern Lighthouses and the Commissioners of Irish Lights. The London Trinity House is responsible for the maintenance and management of lighthouses, buoys, and beacons throughout England and Wales, the Channel Islands and the adjacent seas and islands, and at Gibraltar. The Commissioners of Northern Lights are responsible for those throughout Scotland and the adjacent seas and islands, and the Isle of Man. The Commissioners of Irish Lights have a similar duty throughout Ireland and the adjacent seas and islands. All three have to submit reports, and tender returns connected with this important subject, to the Board of Trade. Light dues are collected from British, but not from foreign, shipping frequenting the ports of the United Kingdom. The payment of these dues is a grievance with the Shipping Community, and the tendency is to lessen their amount. Since the year 1903 successive reductions have decreased the rates charged by no less than 30 per cent. The amount collected represents a tax on British Shipping which might well be remitted. The lighting of the coasts, like the lighting of the streets, should surely be a charge on the whole community.

In concluding the subject of the State regulation of shipping, a few words may be said on the subject of International Agreement on Maritime Questions. There is being built up, very gradually and somewhat slowly it is true, but still progress is being made, a code of International Maritime Law, accepted by all the great Maritime Powers. So far as the subject of salvage and collision are concerned, agreement has been reached by twenty-two Powers, nor should it be difficult to include other subjects equally important to the shipping interests of all nations. Last May (1913) the eleventh Conference of the International Maritime Committee was held at Copenhagen. Conferences like this are calculated to lead to an extension of international friendship, and the mutual understanding of great international interests, and as such should be welcomed and encouraged. At Copenhagen [1] the spirit of amity was very conspicuous, and one member of the Conference was able to point out that, owing to the efforts of the International Maritime Committee, no less than seventy-five per cent. of the worlds' shipping tonnage is subject to uniform laws.

With the development of the Mercantile Marines of other nations, which has been one of the chief characteristics of the commercial history of the past thirty or forty years, the necessity for framing a code of laws equally binding upon all, and regulating shipping in those spheres where there are bound to be possibilities for misunderstanding and friction, is a matter of the first importance. That the shipping community should have taken the matter in hand itself is a most hopeful sign. The International Conference on safety of life at sea, which opened its meetings at the Foreign Office on November 12th, 1913, under the Chairmanship of Lord Mersey, is another great step in the right direction. It is hoped that the outcome of this Conference may be the drawing up of a system under which all ocean-going vessels carrying passengers will be required to hold a certificate of efficiency. These certificates will be recognised by all States signatory to the Convention which is

[1] *Cf. The Shipping World*, May 21, 1913, p. 528.

expected to result from the work of the Conference. An important shipping organ [1] concludes "(1) that the Conference will have an important definite bearing on future legislation; and (2) that the ideals of International Classification and Registry of Ships and of International Life-saving Rules are now within the range of practical politics." Over a hundred delegates and assessors met in London at this great Conference, and it is to be hoped that the lessons gathered from such catastrophies as the loss of the *Titanic* and the *Volturno* may lead to the greater safety of life at sea for the future.

All these international Conferences held to consider the peaceful pursuits of the world, at which are gathered together representatives of interests to whom peace is of vital importance, cannot but have a powerful, even if somewhat indirect effect, on international political relations. If in addition to building up an International Maritime Code, and regulations conducive to safety of life at sea; or smoothing out commercial arrangements connected with the use of a standard form of Bill of Lading, Insurance Policy or Charter Party, these meetings should lead to mutual understandings, bringing in their train the lessening of the burden of armaments, the whole world might well rejoice. Nothing at the present moment is doing so much harm to civilisation, or standing so completely as an obstacle in the way of social reform and the

[1] *Cf. The Shipping World*, November 19, 1913, p. 443.

amelioration of the condition of the masses of all nations, as the insane expenditure on armies and navies, whose main object is destruction, and whose existence occasions poverty to thousands of peace-loving men and women.

BOOK III

TRADE ROUTES

CHAPTER I

FOUR GREAT DEVELOPMENTS IN OCEAN ROUTES

ABOUT five years ago a pamphlet was published which professed to answer in the affirmative the question, "Is Socialism possible?" After sketching out his view of *present conditions* and giving some short notes on the *Artisan*, the *Capitalist*, and *State Employment*, the author states his conviction that Socialism is possible if the State will assume complete ownership over every sphere of activity. Then comes a paragraph which is especially of interest to the shipping community. "Home Rule should be given to all our possessions beyond the seas as soon as it is believed the people are strong and wise enough to look after themselves. England by this time would be producing the bulk of her food supply; indeed, all her own wheat, and with no food supply from, or possessions beyond the seas to protect, the navy could be reduced almost to vanishing point."

It would be quite possible to dismiss a pamphlet of this sort as the vapourings of an uneducated Socialist; but the inference that this country can be almost self-supporting, and can cut down her trade and intercourse with the rest of the world to a minimum, raises the whole question of commerce and exchange. What has commerce done for mankind? Is exchange an advantage? It was discovered in very early days that some individuals were more expert in making certain tools or commodities than others; that the skill of the individual in some one direction enabled him to produce a greater quantity of some one thing than he and those depending on him could consume; that it was to his advantage to specialise on the production of this one thing that he excelled in, because what was true in his case was true of many other individuals, for even in a comparatively small community individual members were experts in a great variety of things; that if each concentrated on his own speciality he could exchange the surplus, which he did not need for himself, against parts of the surplus productions of many of his neighbours, and that by this means the community could live in far greater comfort with far less effort. In other words, whilst primitive man was a self-sufficing unit, he lived a very hard life, and the family which attempted to do everything for itself, and be independent of its neighbours, existed on poor fare, had wretched clothing and housing, and possessed arms and tools of the rudest description. But as each member of a little community learned what he could manufacture best, and gave himself up to that special thing, civilisation began to develop and the human race to make progress. Indeed it may be said that civilisation and progress have gone hand in hand with the recognition and increasing practice of the fact, that, not only individuals, but nations and localities have a natural ability to produce certain things, and that every step towards freeing commerce and making world exchange a greater possibility has resulted in reducing the hardness of labour, lessening the hours of work, and thus giving opportunities for recreation and study, research, and invention hitherto unknown.

To return to the ideal simple life, an ideal which, under modern conditions at all events, can only exist in the imagination; where every individual attempts to live as a self-sufficing unit, or, even with the serious modification, where each country attempts to be self-contained; could only result, in so far as such a policy succeeded, in putting back the clock and retarding progress. For a man gifted by nature to be the designer of an Atlantic liner, or of a fine piece of machinery, to vegetate in the country and grow wheat, or other food-stuffs, in a place where such work could only be carried on at a comparative disadvantage, can only be described as flying in the face of Providence. For a country like England to grow corn, instead of leading the world in commerce and manufactures, would be equally fatuous. Not for a moment would one attempt to belittle the dignity and utility of an agricultural life, nor does one view unmoved the present-day tendency to leave the land and flock into the towns, but there is a just mean in all these things; there are men fitted by nature to be agriculturalists, and there is scope for them to work even in a busy manufacturing country like England; but there are also men fitted to play an equally useful rôle in other spheres, men whose calling is clearly indicated, nor can that call be disregarded without loss to the whole community.

Without commerce and exchange the condition of living for the greater part of mankind would be one of uncertainty. At one time a bountiful harvest would permit of prodigality and waste, at another the niggardliness of nature would result in famine. Commerce consists in putting things where they are most wanted. It is because commerce and exchange have been efficiently organised that such alternations have ceased to affect large areas of the world's surface. Every year there are bad and good harvests in different places. The trader watches the markets, he makes it his business to know where certain commodities will be wanted, and he flourishes in proportion to his success in rightly gauging supply and demand in the markets with which he is connected.

Once having grasped the elemental fact that there was a double advantage to be reaped from an exchange between either individuals or communities of their surplus products, man set himself to work to elaborate methods for facilitating exchanges. The question of routes, vehicles, and transport power all had to be considered. The history of the development of naval architecture shows how man has successfully improved one type of vehicle;

the history of commerce and markets shows how each improvement in route, or vehicle, has led to an increase both in the number and quantity of commodities exchanged; until things which had been considered the luxuries of the rich have become the necessaries of daily life, and are to be seen on the tables of the poorest in the land.

At first the land road and the caravan were the route and vehicle for exchange; then the water road on river, lake, and sea was developed. On the sea, at first, coasting voyages alone were attempted, but sailors becoming more and more venturesome as the arts of navigation and ship-building progressed, the ocean route was eventually opened up, bringing all the world into touch. The river and lake routes were artificially extended by means of canals; while railways have revolutionised the land route, until to-day, thanks to the engineer, the scientist, and the navigator, there is scarcely a point on the earth's surface possessing an economic advantage which has not been brought within the compass of the world's trade.

There have been during modern times four epoch-making developments in ocean routes. The first two of these almost synchronised. Christopher Columbus in the year 1492 made his first voyage across the Atlantic, and six years later Vasco da Gama, having rounded the Cape of Good Hope, coasted about half-way up the east side of Africa, whence he crossed the Indian Ocean, and thereby opened up a new route to the Far East. These two events, the one opening a new world to discovery, colonisation, trade, and commerce; the other taking the worst of the sting out of Turkish domination in South-eastern Europe, and shifting the centre of commerce eventually from the Mediterranean to Western Europe, were in the true sense of the word epoch-making. These together with the great strides made in marine architecture, already described, gave the ocean routes not only an advantage, but a growing superiority over any of the land, or land and water, routes hitherto made use of by mankind for trading purposes. When the work of discovery was completed by the efforts of Cook and others in the Pacific, there remained but two developments which could comparably affect the commercial world. A cursory glance at a map of the world shows that ocean traffic was barred at two points, and the bar in each case *looked* insignificant. A ship might sail up either the Mediterranean or the Red Sea, but although the Delta of the Nile and the lakes reduced the bar to a few miles of sand, those few miles were sufficient to block routes that would reduce the distance between Western Europe and India by 4000 miles. And again, looking from Europe westward across the Atlantic, a somewhat similar obstacle made it necessary for shipping bound for the Pacific ports and countries, to round Cape Horn, and add both in distance and in danger to their voyages. In both these instances so soon as commerce was developed and organised on a satisfactory and continuous system, it was but a question of time for the obstacles to be removed. The removal of these obstacles to trade had for long years been contemplated, indeed a small canal had been constructed about forty centuries ago where that of Suez now runs, and in the year 1504 a ship canal was projected but not persevered with in the hope of enabling Venice to maintain her trading relations with the Far East. The early voyagers to Panama, too, had advised Philip the Second of Spain of the advantages to be reaped by piercing that Isthmus; but his spiritual advisers suggesting that what God had joined together man must not part asunder, Philip had dismissed the scheme.

The bar at Suez was eventually removed by a great Frenchman, Ferdinand de Lesseps, but not until the year 1869. This achievement marked a third epoch-making development in the history of ocean commerce. But the consequences have been curiously different from what was confidently[1] expected. The last great event is now (1914) on the eve of accomplishment, for it is confidently stated that the official opening of the Panama Canal will take place on the first day of the year 1915. Around these four great events hangs the story of trade routes, thus it is to them that we must next direct our attention.

[1] *Cf.* pp. 313-314.

CHAPTER II

THE CAPE ROUTE TO INDIA AND THE DISCOVERY OF AMERICA

Excluding ancient history as being beyond the scope of this essay, in the later middle ages Venice was commercially supreme on the Mediterranean, and in the trade carried on between Europe and the Far East. Land routes linked up the sea routes. Venetian galleys loaded rich cargoes at the Levant ports—the road ends of the caravan routes—and took them either to Venice, whence they might be distributed throughout Central Europe, or, sailing along the northern coast of the Mediterranean, visiting numerous ports, they passed through the Straits of Gibraltar, and sailed to the commercial towns of Western Europe. Other nations and states, envying the great wealth of Venice, began to foster and develop trade. Spain, Portugal, Flanders, and England all extended the purely local commerce that they had hitherto carried on, a trade employing for the most part only small coasting vessels. The Portuguese began creeping down the west coast of Africa, and when the Turks captured Constantinople, which gave them a hold over the traffic between Europe and the Far East, navigators were spurred on to discover new and freer routes, by which the commodities of the East might reach Europe without let or hindrance. Columbus dreamed that the desired route might lie to the westward, and was the pioneer in the discovery of the Americas; the Portuguese rounded the Cape of Good Hope and discovered the long sea route to India, China and Japan. Englishmen at first tried their fortunes further to the north; to the westward they discovered Newfoundland and the coast of North America; to the eastward they rounded the North Cape, and although they failed in their main object —a new route to the Indies—they sailed into the White Sea, reached Archangel, and thus discovered a new route to Russia. By tapping Russian trade in the north, they broke the monopoly of the Hanse League in the Baltic. From the end of the fifteenth to the middle of the eighteenth century is one of the most interesting periods in both political and commercial history. Who was to benefit by these discoveries? The old world theory was that only one nation could gain an advantage by trade; each must therefore fight for self. It was not yet realised, indeed it could not be grasped, that the more widely commerce stretches, and the more parties there are engaged in it, the greater may be the all-round gain.

The old-world hankering after monopoly led the two Peninsular countries to obtain from Pope Alexander the Sixth a bull giving them exclusive rights over the greater part of the trading world, an imaginary line being drawn between the area assigned to each; and, on the strength of this, they attempted to prohibit competitors from other countries. Religious strife was added to commercial competition, and thus under the Tudors, men like Hawkins, Drake, and Frobisher insisted on their rights to trade with the Indies, or, when that was refused them, did not hesitate to make reprisals which cost Spain dear. What had commenced as a patriotic effort to prevent or break down an objectionable attempt to monopolise the trade and riches of the New World, degenerated into piracy. And the stories of the Spanish Main with all their cruelty and wrong-doing are directly traceable to the unjust assumptions of Spain. But Englishmen during this period were steadily developing legitimate commerce on every available ocean. The East India Company was organised and eventually carried to a successful issue. The trade of the Far East was systematised and regularised, and although the monopoly of the one favoured Company grew to be a hindrance and an obstacle to trade, for a time some such arrangement was an indispensable necessity. While this was going on in the East, merchants, shippers, and settlers were achieving as great success or even greater in the West. England and France obtained spheres of influence in North America, and after a sharp contest England ousted France from Canada, only within a few years of this success to lose, by bad government, her own original holding, which has developed into the United States of

America. By the end of the eighteenth century every navigable sea had been explored, and immense possibilities for trade and commerce had been opened up.

This period, then, is of special interest; modern sea trade routes began to take their shape; the modern era of world commerce had dawned. From the first, too, England, rapidly improving her position among European nations, began to play a prominent rôle both in commerce and discovery. Prior to the days of the Tudors, English trade had for the most part been restricted to the waters of Western Europe. Merchants like the Poles of Hull, Canynge of Bristol, and Whittington of London were exceptional people. Under the Plantagenets trade had been fostered and shipping had increased, but it was under the Tudors that the great advance was to take place. During the reign of Henry VII. English ships visited the Levant ports—it was at this time indeed that the first tariff war in our annals took place. The origin of this was the attempt of Venice to prevent English ships from trading direct with Crete. In the year 1490 a special duty was granted to Henry VII. on malmsey wine imported by any merchant stranger from Crete. That island was then under the sway of Venice, and in order to keep the trade of that part of their dominions in their own hands, the Venetians had imposed additional duties on Candian wines laden by Englishmen in English ships. The English reply to this was the grant of 1490, eighteen shillings on the butt of malmsey. And it was distinctly enacted that this duty was to continue until the Venetians should abate their new imposition of four ducats at Candy.

It was not, however, until nearly three-quarters of a century after this that English shipping began to develop along new routes. The defeat of the Armada is undoubtedly the great date marking the opening of a new epoch during which England was to claim and successfully assert her right to be a world trader of the first rank.

As has already been mentioned, a new commercial route was opened up between England and Russia in the year 1553. Three little ships under Sir Hugh Willoughby sailed with the object of discovering a north-east passage to the Indies. The leader and two ships' companies perished owing to exposure, but the third ship under Richard Chancellor rounded the North Cape, sailed up the White Sea to Archangel, and opened up trading relations with Moscow. Chancellor made a second voyage in the year 1555, under the direction of the Incorporated Society of Merchant Adventurers. The cargoes which these ships brought back were of great value, and the trade proving of advantage to both nations, was steadily developed. The Hanse Merchants had enjoyed a monopoly, but as usually happens, had abused their privileges. The Czar, taking advantage of the new development under Chancellor, issued an order expelling the members of the Hanse League from his dominions, and thenceforward favoured the English. This led to the formation of the Russia Company which was the first of our great chartered trading companies. The next route to be developed was to the West Coast of Africa. English trade to this region began about the year 1539, and is indissolubly connected with the name of Hawkins. William Hawkins of Plymouth touched the coast of Guinea, prior to crossing the Atlantic to Brazil; and his more famous son—Sir John Hawkins—from the year 1562, opened up a traffic in slaves, between the west coast of Africa and the West Indies. But trading in these regions prior to 1588 required extreme daring. The reputation of Spain was at its zenith, nor had it been realised that her commercial and maritime supremacy was but a bubble, merely requiring to be pricked to reveal its want of solidity.

Martin Frobisher attempted to open up a new trade, sailing first in the year 1576 with an expedition to explore the north-west. John Davis continued the effort to thoroughly explore this region, and his reports as to the numbers of whales encountered in the Polar seas led to the establishment of our whale fisheries.

Before Davis's first voyage to the north-west, the attempts to find a north-east passage had proved unavailing. This had suggested to Anthony Jenkinson, a leading merchant and member of the Russia Company, the feasibility of extending the new Russian route so as to reach India by navigating the Volga. He spent about two years in searching for a suitable route via Astrakan and Bokhara. But the difficulties encountered on the road, together with the lack of opportunities for trading on the route, were such that he reported adversely.

Then John Newbery and Ralph Fitch attempted to open up trading relations between England and the Far East via the Mediterranean, and overland to the Persian Gulf, but they were imprisoned as spies by the Portuguese at Ormuz, sent prisoners to Goa and passed through many adventures. The land road was thus found to be both too uneconomic and too dangerous. Hence the next attempts that were organised had as their aim the opening up of an all-sea route to the Indies by way of the Cape of Good Hope. This proved to be both possible and profitable, and before the century ran out the East India Company had been founded and had definitely adopted the Cape route, which was to be without a rival, until with the application of steam to navigable craft, the route via the Mediterranean was adopted for passengers and mails, but cargo continued to be carried via the Cape until the opening of the Suez Canal in 1869.

The charter of the East India Company developed into a monopoly of the Far Eastern trade, which prevented English competition, but could not prevent the merchants and shipping of other European States from trading in the Far East. The Cape route trade had originally been developed by the enterprise of the Portuguese, but unfortunately for Portugal the glowing prospect of wealth and commercial importance had produced a disastrous effect. The rich cargoes from India, China, and Japan, and the possibility of an almost equally rich traffic with Brazil, turned the heads of the trading community. The small things of trade and business were neglected. The only manufactures worthy of attention were thought to be those connected with the construction of ocean-going ships; and in commerce, long voyages alone were worthy of a Portuguese; hence retail trading was not only discredited, but was left to others. Portuguese ships brought valuable cargoes from distant parts of the world to Lisbon, which became for a time a great emporium. The Indiamen arrived in the Tagus richly laden with goods required by most European States; hence there was a big distributing trade, presenting many opportunities for making money, and for still further extending trade. But such retail dealings being beneath the dignity of a Portuguese merchant, the distributive trade was left to humbler folk; and of these the Dutch were easily first. The Dutch grew rich, thanks very greatly to the trade the Portuguese despised. Then came an exceedingly interesting development, well worthy of note, showing how unexpected causes may lead to results of the greatest importance. For over half a century Spain and Portugal were united under one Sovereign. The first of these kings was Philip II., one of the most intolerant of rulers. He decreed that no heretic ships should enter the ports of the Peninsula. The Dutch, being heretics, were vitally affected, and doubtless Philip congratulated himself on having originated a policy calculated to cost these rebellious Dutchmen dear. But the Dutch were by no means the kind of people to take such treatment *lying down*. Their long experience in the fisheries had made them expert, intrepid navigators, and they could build ships equal to any then afloat. They had been content with the distributing trade so long as they could pursue it peacefully, but since they were to be shut out from the retail trade, they determined to take bold measures. If they might not trade with Lisbon, they would go to the Far East themselves, and fetch home cargoes for distribution over Western and Northern Europe; and one of their own ports should take the place of Lisbon as an emporium. This forward policy led to the rise of Amsterdam, a city which enjoyed for a considerable time a position of supremacy in the commercial world. This development, too, was of the greatest importance to England and the new East India Company. When English ships began to trade in Far Eastern waters, they found that the Dutch had taken from the Portuguese the best of the trade, and had become the paramount trading power in those regions. Nor were the Dutch unaware of the danger of allowing so active a competitor as the English to enter these trades unchallenged. By every means in their power they opposed the new-comers, but it was realised by the English that the trade was too lucrative, and offered too tempting a future to be relinquished without a struggle.

The answer of the English Company to the strenuous opposition of the Dutch was to get their charter renewed in the year 1609 for fifteen years, and they then constructed a new ship, the *Trades Increase*, measuring twelve hundred tons, the largest merchant ship as yet built in England. This ship was unfortunate, but others were successful, and additional new routes were opened up. The Emperor Jehanghir favoured the English with special privileges and protection, and permitted the Company to establish a factory at Surat. Going farther east, through the instrumentality of William Adams, they even entered into trading relations for a short time with Japan.

The Dutch, however, were undoubtedly the greatest traders of the seventeenth century. Their growing wealth and expanding prosperity were exemplified by the foundation of the great Bank of Amsterdam in the year 1609. This may be considered as the first of the great modern European commercial banks. By its currency arrangements, and the possibility of using paper credits instead of cash payments, the Dutch merchants were enabled to enjoy to the full the profits of their ever-extending commerce. So prosperous and well-managed was the Dutch East India Company that its English compeer made but little progress. It seemed to be destined that Holland, not England, should be mistress of the seas.

The original East India Company traded not only in Indian waters, but had developed a Greenland whale fishery, which had apparently been quite flourishing from the year 1598 to 1612. Now, however, the active hostility of the Dutch led to a curtailing of operations. The relations with Japan were broken off, and the Greenland business was abandoned.

Whether the States of Europe were friendly among themselves at this time or not, the condition of affairs in foreign waters led to the saying becoming a proverb, "there is no peace beyond the line." In a report made to Parliament in the year 1621, the East India Company note that out of eighty-six ships sent out to India during the past twenty years, eleven had been seized by the Dutch, nine had been lost, only thirty-six had returned with cargoes, twenty-five were still in India or on the high seas, and five were worn out. Fortunately, however, in spite of troubles at home and abroad, the Company, although liquidation was proposed, did keep afloat.

During the political troubles which beset England throughout the greater part of the seventeenth century, Holland had an unequalled opportunity and made the most of it. Dutch ships sailed on every sea, opened up new trades, and prospered amazingly. In the year 1638 they finally ousted the Portuguese from the trade of Japan, within twenty years of this they took possession of Ceylon, and their hold on the Cape of Good Hope was most valuable for their Eastern trade. During the same time English trading expansion progressed on the most modest lines. In the year 1646 the East India Company obtained possession of Madras, which was for a long time their chief station in Eastern waters. That under the circumstances Englishmen were able to maintain direct trading relations at all with the Far East was remarkable. Perseverance, however, in due time reaped its reward. The Dutch, in their dealings with India, were hardly less rapacious than the Portuguese had been, and this it was that opened the way eventually to the English trader. There may be regrettable incidents connected with our own relations with Eastern peoples; it may, however, be suggested that on the whole the English proved themselves more acceptable to the Eastern nations as traders than any European competitors.

During the early years of the seventeenth century English shipping fell to a very low ebb, but, in spite of this, some ship-owners kept to the fore. The American trade began to develop, although Sir Walter Raleigh's big schemes proved unsuccessful. New routes, too, were opened across the Atlantic; for instance, in the year 1602, Captain Gosnold made the first direct voyage to the American coast. Previously it had been the practice to make for the Canary Islands, then across to the West India Islands and through the Gulf of Florida; the object probably being to make the voyage out of sight of land as short as possible. It must be remembered that nautical instruments were of the rudest description, and the art of navigation still in its infancy. The rise of modern navigation took place with the invention of the sextant and chronometer. These two important aids to the navigator were invented within quite a short time of each other; the sextant in the year 1731, the chronometer four years later. It was thus towards the middle of the eighteenth century that a great advance became possible, nor were the new possibilities neglected. The Englishman of the seventeenth century, however, was made of sterling stuff, quite prepared to make the best of even the unsatisfactory instruments available for navigation; thus colonisation progressed apace. During the reigns of James I. and Charles I. the English plantations in North America were greatly extended, and the foundations of a Europeanised America firmly laid. Hudson explored the north, and gave his name to America's greatest bay. The coast-line thence southward to the Gulf of Mexico was explored, and settlement went on with ever-increasing success. When Queen Elizabeth died, not an inch of American soil had been settled by Englishmen; within half a century, not only had settlements been founded, but they had begun to enter upon a period of consolidation, if not of prosperity. In the south the English took possession of unappropriated islands in the West Indies, and in 1641 Lord Willoughby planted the English flag on the southern continent at Surinam. All this work of settlement led to an increasing number of voyages across the Atlantic; for a time, however, the commercial results were not great, but the ultimate effect on our mercantile marine cannot be overstated.

Towards the end of the seventeenth century English ships had opened up trade on practically every known sea, and the foundations of a world commerce had been laid, but contemporaries could hardly have foreseen the supremacy which was to come. Both the French and the Dutch were still in the lists, nor was there any apparent reason against Holland becoming the supreme shipping power. As the eighteenth century unfolded itself, North America became predominantly English, and after the cession of Canada to England by France, and the expansion of English influence in India, it might have been more confidently predicted that the future would belong to England. But when within a few years the original American Colonies declared their independence of the English crown such confidence would have been rudely shaken.

New developments, however, were taking place in other and newer regions. This was the time of Captain Cook's great discoveries. His work opened up Australasia; and the attention of far-seeing statesmen and business men turned with increasing interest to these new lands in the far-off Pacific. With the end of the century, the convulsions caused on the European continent by Napoleon, enabled England, protected by the Channel, to develop her commerce unhindered. But the new nation, founded by the Declaration of Independence, full of the energy of youth, and possessing resources almost entirely undeveloped, began to compete with her shipping in every trade. With great forests supplying shipbuilding materials in vast quantities and at low cost, the United States for a time became a formidable rival of this country. During the first half of the nineteenth century there were many favouring circumstances giving advantages to American ships; nor was it until about the time of the Civil War that the United States mercantile marine dwindled, and England was left supreme on the seas—a supremacy destined to last throughout the remainder of the century. Of recent years Germany has by extraordinary exertions, and by a determination which cannot be too much admired, become a great mercantile and naval power. America too undoubtedly hopes that the opening of the Panama Canal will usher in a new period of prosperity, during which her ships will again compete, possibly with great advantage, for the world's trade. Already predictions are current as to a rapid increase of American shipping, destined to compete in every trade and eventually to gain the position so long and so honourably held by England. As to this, time alone can show. At present, at any rate, there is ample room for two opinions on the subject.

CHAPTER III

IMPROVEMENTS IN THE ART OF NAVIGATION

THE discoveries of the eighteenth century and the opening up of new trade routes to all parts of the world were rendered possible by a series of important scientific inventions and researches which almost completely revolutionised the art of navigation. Originally in sailing from one port to another, a ship hugged the land as closely as possible; then experience made the mariner bolder, and with the introduction of the compass during the twelfth century, and by means of a little astronomical knowledge, the sailor ventured further from the land. The Portuguese, the first to make long sea voyages, gradually became familiar with the west coast of Africa. A great advance was made when the Cape was safely rounded, and superstitious fears as to what existed beyond were exploded. Creeping up the east coast of Africa rumours of the possibility of crossing to India were confirmed. Da Gama landed first on the coast of what is now Natal, then proceeded northward to Mozambique, Kilwa and Melinde. The king of the last place furnished him with pilots who navigated his ships to Calicut. It is recorded that the expedition waited for the monsoon to change. This waiting for the monsoon to change opens up another chapter in the history of navigation. Arab navigators had noted the regularity and steadiness of direction of the winds prevailing in the Indian Ocean. Each year experience showed that from April to October the wind would blow from the south-west; while from October to April the direction would be directly the contrary. This regularity led the Arabs to name these winds *Mausim* (set time)—which word has degenerated into *Monsoon*. The regularity of the wind enabled mariners to go long distances across the Indian Ocean, far out of sight of land, trusting to a compass, and knowing that the land in the opposite direction from which they commenced their voyage would be safely reached. As the various seas and oceans became better known, other phenomena connected with the winds were noted, and by the year 1735 George Hadley propounded the theory of trade winds. His work was but little noticed until, about half a century later, John Dalton, by independent observation, arrived at very similar conclusions, and published them in the year 1793 under the title of *Meteorological Essays*.

From that time onward the science of navigation has made great progress. Increasingly satisfactory instruments, the sextant, the chronometer, and the compass—the last perfected by Lord Kelvin in our own time—enable the sailor to steer his course with scientific precision, whilst the charting of every region of the world, and the information available as the result of the work of the meteorologist, have raised navigation to the level of an exact science. This advance resulted from the joint work of English and American officers, carried to completion by the Meteorological Office. For a sailing ship to make a quick passage between two distant ports, it is necessary that the Captain should have clear knowledge or experience of the best routes. Thus one of the first lessons a navigator has to learn is that the shortest *distance* between any two ports is not necessarily the best or quickest route to take. Routes have been standardised, and in the *Sailing Directions*, published by the Admiralty, these ocean passages are laid down and explained. The experience by which these sailing directions have been compiled has been extracted from the data in innumerable log-books. This work was commenced by some officers of the East India Company who went carefully through some thousands of the log-books of the Company's ships, noting every relevant fact, and by means of combining the data thus collected, they produced a corpus of information as to wind, weather, currents, tides, and other phenomena, making clear many points which had previously caused difficulties and dangers to the mariner. This work was continued by others, notably by James Horsburgh (1762-1836), who collected further data from the log-books of the British Navy, and also those of Dutch East Indiamen. His work again was improved upon by a well-known American sailor, Lieutenant Matthew

Fontaine Maury, who, when about thirty years of age, published, in the year 1834, his well-known book on Navigation. A few years later a serious accident crippled him permanently, but he devoted his life to further researches in the science and art of navigation. In the year 1856 he published *The Physical Geography of the Sea*, in addition to which he wrote books on *Great Circle Sailing*, *Ocean Currents*, and similar subjects. His researches crystallised and developed the work of his predecessors, and still further added to the interest and the safety of practical navigation. Finally the work was brought to completion, so far as such work can be, by the Meteorological Office, which was established as a department of the Board of Trade in the year 1854. The work of the Office now consists in the collection and consideration of meteorological observations from all parts of the world. A number of stations are maintained, whence daily telegraphic reports are received, and these are utilised for the compilation of forecasts and storm warnings, whilst with the co-operation of Captains, both naval and mercantile, the work, previously accomplished, is kept thoroughly up-to-date.

The Meteorological Office took this important matter in hand in a very practical manner. The ocean was first of all plotted out into squares of 5 or 10 degrees each, and tables for every month of the year were compiled showing the various phenomena connected with currents, winds, temperature and so on. As a result of this it was realised that the outward passage of a sailing ship to Australia, India, China, South Africa, South America, round Cape Horn, or even to St Helena, hinged on the time the vessel took to pass from about 12 degrees north to the Equator, and between the meridians of 20 degrees and 30 degrees west longitude. This portion of the Atlantic is now subdivided into squares of 2 degrees for each month of the year, and tables have been compiled which show the direction and force of the wind, the direction and force of currents, the temperatures of the air and sea water. With all this information available, the navigator experiences but little difficulty in laying down a course; for instance, in the case of a ship sailing from London to an Australian port, the Captain can, by means of the available data, lay out his route before he is out of the English Channel. For he knows that in the mean normal conditions of the trade wind in the North Atlantic the north-east [1] trade wind will commence about 25 degrees north on the African side, and will be lost about 10 degrees north when he will encounter the doldrums. What he has to aim at is to lose the trade wind at a place where he will not have long to wait for wind from some quarter. The south-east trade wind commences between 25 and 30 degrees south on the African side of the Altantic, and runs on to the Equator. On the American side of the Atlantic, north or south, the trade wind does not come on the Polar side of 20 degrees.

[1] *Cf.* Map of Trade Routes.

Thus by the middle of the nineteenth century not only had all the possible trading areas of the world been made known, but science and invention had placed within the reach of the mariner the possibility of laying down trade routes between even the most distant ports, which could be followed with almost absolute certainty; and lastly, as has already been described, the naval architect and the engineer were building vessels of an excellence never previously approached. The trade of the world was carried on by means of sailing ships, and these ships were destined to carry on a very considerable though decreasing part of that trade for another thirty or forty years. The main ocean routes followed by sailing ships are still of great importance, there being some ship-owners who even yet refuse to admit that the days of the sailing ship are over, indeed quite recently the wool merchants of Yorkshire have been complaining of the quick deliveries of wool by steamer, and have suggested a reversion to the sailing ship whose slower and more uncertain voyages save warehouse rent and minimise the possibility of a glut of wool on the market.

CHAPTER IV

THE SUEZ CANAL (I)

WITH the discovery of the Cape Route to India not only were trade routes revolutionised, but commercial centres were vitally affected. For centuries Venice had been the great commercial power; would she be able to maintain her pre-eminence under the new conditions? She possessed the shipping, her merchants had the advantage of experience, her trade was organised, and followed, both in the collection and distribution of goods, well-defined routes. Could she break away from the established routes, modernise her methods and compete with the Portuguese on their newly discovered route to the Far East? This was the situation that Venetian merchants had to face at the dawn of the sixteenth century. They had wealth, knowledge, and experience; yet they failed to move with the times, and their commercial supremacy passed to other and abler hands. It is of interest to know whether this failure of Venice was unavoidable. The ports of Western Europe waxed as Venice waned, nor has the pre-eminence in commerce since departed from the west. Nearly half a century ago a reversion of the centre of commerce to the Mediterranean was freely prophesied when the Suez Canal was opened. But the western ports have held their own in a very remarkable way, nor has there been any really serious competition from the Mediterranean. The explanation seems to be that Venice lost her supremacy, not so much because a new route had been opened up, as because she had become effete. Her methods of trading had lost their elasticity; her merchants were not able to modify their methods in accordance with new conditions. All through history, the individual or the community that is content to stand still, that loses elasticity, becomes set in methods, and is unprogressive, has been eclipsed. Especially is this true in commercial history. As soon as a trading community ceases to progress with the times, and begins to believe that what has served former generations must pass unquestioned, it has invariably sealed its own doom. In 1869 the position was reversed; it was confidently predicted that, with the opening of the Suez Canal, the ports of Italy and southern France would take a new position; the Mediterranean would once again become the great centre of trade, and the ports of Western Europe would lose their paramount position in the world's commerce. Such a view was much too restricted. Those who enunciated it failed to realise the integration of commerce. The argument was stated from incomplete premises: given a new and shorter route between great markets, given the geographical advantages of certain seaports on that route, then when the new route became open to trade these ports must benefit at the expense of those which had previously enjoyed the trade. Such an argument looks quite incontrovertible on paper, but it leaves out of account several important factors connected with the situation. Foremost among these is the human agent—will those who have been engaged in a prosperous trade be content to surrender it without a struggle ; have those who are in a position to develop the shipping in the new ports, the ability and the capital necessary to enable them to take full advantage of the opportunity when it comes ? The trade at stake, too, consists of two separate entities. There is first the transport service requiring ships and all that such a service entails, an industry of which the termini and routes can be changed without necessarily affecting either ownership or nationality. For instance, at the present moment it is calculated that at least one-fifth of the tonnage of the United Kingdom is engaged abroad, seldom or never coming to English ports. Presumably a much greater proportion of our tonnage might be engaged in such service without affecting the supremacy of our mercantile marine. Secondly, there must also be considered the manufacturing interest. Great Britain has not only a great mercantile marine, but is also one of the leading manufacturing nations, sending her manufactured goods to all parts of the world. What effect will the opening up of a new route have on markets ? These questions are even more alive to-day than they were in the year 1869. Then in the manufacturing sphere England enjoyed an unchallenged pre-eminence—now other nations have entered the lists, and in more than one field England comes second. The United States and Germany have attained to an enviable position as producers of manufactured goods, whilst it is the aim of all civilised countries to free themselves from the drain on their resources inseparably connected with the production and supply of raw materials for other countries to manufacture. The stage of rapid transition through which the Far East is now passing has been fostered and accentuated very greatly by this desire. It is quite possible that owing to the shifting of commercial centres a nation might suffer as a manufacturer of goods for foreign markets, without her shipping interests suffering any diminution. But in both spheres the two controlling factors are the capacity of the business man, and the money market. It was mainly these two factors that decided the issue when the Suez Canal was opened; and the ultimate effect on trade and commerce of the new routes opened up by the piercing of the Isthmus of Panama will undoubtedly be shaped very greatly by them. What resulted owing to the opening of the Suez route, and its causes, are therefore of considerable present-day interest. Would British ship-owners and merchants cling obstinately to the old routes, would their sailing ships continue to run via the Cape to the Far East and to Australia? This question was soon answered.

The men who had to make the decision in 1869 were of Teutonic stock; the Venetians who inertly let the trade slip through their fingers at the beginning of the sixteenth century were of the Latin race. This difference meant much. The Latin is too apt not only in business, but in all spheres, art, literature, even religion to worship a dead past. The Anglo-Saxon branch of the Teutonic race has, during the past three centuries, shown increasingly a masterly capacity for acting at the psychological moment. The Englishman is alive and alert, not bound by tradition, although healthily conservative in some things. While other people are considering and discussing, he acts. This is one of the chief secrets of British success. The Briton is not boastful, he perhaps takes life somewhat sadly, but as a man of action he is unrivalled. Whilst mainly Teutonic, he has absorbed many of the best elements of other races, and as a result there is a combination of progressiveness mingled with caution, which for commercial purposes is the guarantee of success. This is the explanation of the fact that so many new possibilities are exploited by Englishmen. It was so with the shipping industry forty years ago. A new ocean route was opened up to the world by the piercing of a great natural barrier to shipping. In order to utilise this new route, and make the most of it, a new type of ship was required. That the opening of the Suez Canal was a death-blow to the sailing ship was fairly generally realised, because the Red Sea is not navigable by sail, but it was also even more decisively and immediately the death-blow to the existing type of steamer.

Steamship owners, engaged in the Eastern trades, in order to take full advantage of the Canal, must scrap their existing fleets and build steamers of a special type. Would they do this, could they do it? They had many thousands of tons of steamships operating, why not continue to run these obsolescents, and gradually renew their fleets with the new type as time went on! But there was the possibility that the foreigner with no tonnage in existence might enter the trade with the requisite type of steamship, and had he done so, to recover the lost ground would have severely tried the resources of British owners. Our premier shipping company in the Eastern trade had something like 100,000 tons of steamers rendered unsuitable. Without unnecessary hesitation this fleet was replaced by ships of the required type, fitted with the new marine engine which has already been discussed in these pages.

It was a hazardous step to take, but although it required time to justify the action of the management, the consequent reductions in rates of freight and passage money, which averaged somewhere between 50 and 75 per cent. on those previously charged, eventually and completely justified the policy. Nor was this the only British shipping company that adopted up-to-date methods, the result being that throughout the history of the

Canal the British flag has been easily first among the shipping making use of this great highway to the East.

The credit, however, must not be wholly and entirely allotted to the ship-owners. There is an interdependence of industries which is, and has for long been, an important feature of modern industrial history. The British ship-owner, by his integrity, acumen, and progressiveness, has built up a very strong position, he has, however, been very greatly assisted in this by the Banker. Indeed, but for the great accumulation of loanable capital available in this country, many a successful industry would have been severely restricted in its sphere of operation. The debt that English industries owe to the English banker is not nearly so generally recognised as it ought to be. The great assistance banking has been able to lend to commerce, is the result of the capacity and integrity of our bankers, strengthened by our long immunity from foreign invasion, thanks to our insular position and command of the sea. Other countries have been almost as rich in actual solid wealth as England, but that wealth has not been concentrated and available for industrial purposes. England has enjoyed for many decades now the great advantage of a well-supplied money market, whence the man of proved capacity can obtain the necessary capital to finance any scheme promising to yield a suitable return. Since the days of the Stuarts, bank reserves have been sacred so far as Government is concerned in this country. This security, together with the traditional ability and integrity of our bankers, is the secret of the success of deposit banking.

Every rank of the community has learned to realise that money deposited in a good bank is very much safer than it would have been if hoarded in the house. The proverbial stocking, still so much utilised abroad for preserving the family savings, has had but slight vogue in this country. Great wealth scattered over a country in hoards may produce a wealthy country, but much less wealth concentrated by means of deposit banks, and available on a central money market for purposes of industry and commerce, will give the country enjoying such an advantage a very great initial superiority when new trades emerge. It was owing to such an accumulation of capital that England was able to organise trade connected with the new route to the Far East, while other countries equally wealthy, but without a comparable accumulation of borrowable capital, were considering ways and means. The progressiveness of our ship-owners might have been severely handicapped, but for the tradition that leads to the banking of all but pocket cash in this country. The integrity and security of our banking system gave then, and continues to give, an unequalled money market. The probity of our ship-owners, notably at that time, enabled them to obtain the *sinews of commerce* at the critical moment, and so to maintain their supremacy in these important trading spheres. Money market conditions have changed since 1869. England's position is no longer unique in that respect, but so far as the human factor, which is the most important element in commercial success, is concerned, England has little need for undue anxiety.

The events of the next few years will show whether Governmental action and money market facilities, together with perhaps a certain geographical superiority, will outweigh the advantages which have enabled England to build up and for so long to enjoy the supremacy in the world of shipping and commerce.

THE SUEZ CANAL (II)

ITS CONSTRUCTION AND WHAT IT HAS EFFECTED

The discovery of the long ocean route to the Far East resulted from the work of several men of one nationality. The opening up of the new sea route by the construction of the Suez Canal was due to the genius and intrepidity of one man, Ferdinand de Lesseps, aided by his own country, France. The successful completion of the Canal was a signal triumph for genius and bulldog courage over seemingly overwhelming obstacles. The work was commenced in spite of the opposition of the leading European statesman of the time, Lord Palmerston, seconded by England's greatest diplomatist, Lord Stratford de Redcliffe, and supported by an overwhelming majority in England; an opposition based for the most part on the conviction that the new route, if once successfully operating, would be a death-blow to many thousands of tons of British shipping, and possibly to British commercial supremacy. That the first part of this fear was true, the fate of China clippers and many fine steamers proves only too fully.

M. de Lesseps has left on record his version of the progress of events leading up to the final success of 1869. From this it can be gathered that whilst he was in Egypt as French Consular Agent, from 1831 to 1838, he became convinced of the possibility of piercing the Isthmus of Suez. On retiring from the Government service in the year 1849, he determined to study thoroughly the subject, and as a result of four years' investigations, he was convinced on two points: it would be possible to construct the Canal; and when constructed, it would be possible to maintain a clear navigable channel. He then reduced his views to writing, with the intention of submitting them to the then Khedive, Abbas Pasha. De Lesseps' friends, however, knowing the Khedive, dissuaded him from this, and he went to Constantinople in order to obtain from the Turkish Government permission to construct a canal. Failing to get a favourable reception he bided his time. In 1850 Abbas died, and Mohammed Said, who had been de Lesseps' great friend for many years, became Khedive. In an interview the new Khedive was won over, promised his support to the scheme, and on the 30th November conferred the concession on his friend. After some weeks spent in surveying the route, de Lesseps went to Constantinople to get the Sultan's confirmation of the concession; it was then that he discovered that there was going to be serious opposition. But in spite of this he obtained an official letter to the Khedive, authorising him to continue considering the project. De Lesseps went westward hoping to float a company, and obtain the necessary capital for the undertaking in France and England. In France he was received enthusiastically, and raised 120 million francs. In England, however, although some of the leading business men and scientists were sympathetic, the response, on the whole, was not encouraging. De Lesseps himself attributed this to national jealousy. It is possible that some feeling of that sort existed, but there were other and weightier reasons. The English ship-owner was only just in the process of overcoming American competition in the ocean carrying trade. English ingenuity had just produced a sailing ship superior to anything that any other maritime country could launch in competition. Steam had, it is true, been applied to a certain and special class of ocean-going vessels, but steamers were still of unproved value in general trade. In the event of the Canal proving a success, the sailing ship could not make use of it; and at the time there was not sufficient steamship tonnage afloat to make the Canal a paying concern, even though the whole available steam tonnage were run on the new route. Moreover, until the steamship had been subjected to further tests as a cargo carrier, and this would under the circumstances require the experience of some years at least, it was unlikely that there would be a great increase of steamship tonnage for some considerable time. In a sentence, steam had yet to prove its efficiency. Not only was this the case so far as tonnage in existence was concerned, but some of the best engineering opinion of the day was altogether unfavourable to the Canal scheme. Within half a century Napoleon I. had employed the best French engineers to project a canal, and these men had reported, after making an exhaustive examination of the route, that the piercing of the Isthmus was an impossibility, owing to the difference of level between the Mediterranean and the Red Sea. Men of the day like Robert Stephenson were equally positive that the scheme, even if carried out, could not be financially successful.

Thus it cannot be wondered at, that with considerable vested interests at stake, supported by the chances of financial and constructional failure, and strengthened by a certain amount of national sensitiveness, and the thought of England's interests in India, English public opinion remained cold, and that the English Government was indirectly hostile to the project.

The situation was by no means rosy for M. de

Lesseps, however, as he tersely puts it, "Je poursuivis mes études d'exécution," and he succeeded in getting a commission of scientists, representing all nations, to examine into the scheme; and this commission reported favourably. Thus on the 5th of January 1856, the Khedive confirmed his concession, and de Lesseps was authorised to form a company for the construction of the Suez Canal.

The conflict of interests, however, had only just begun, for to make a long and wearying story as short as possible, it took just ten years of strenuous effort to beat down opposition, mainly English, and get from the Sultan of Turkey consent to proceed with the work of construction. Without, however, waiting for this formality, de Lesseps "cut the first sod" on April 25th, 1859. It was first of all necessary to cut a fresh water canal from the Nile to the centre of the Isthmus—this was finished by the year 1862. Next year Ismail Pasha succeeded Mohammed Said as Khedive, and fortunately was favourable to the work. Further complications and disputes, however, led to a case for arbitration being submitted to the Emperor Napoleon III. As a result, forced labour had to be withdrawn; machines were substituted for hand labour, and a new working agreement was arranged with the Egyptian Government. This occurred in July 1864; in October 1865 Lord Palmerston died, and four years later de Lesseps brought his great work to a successful issue. On

Wednesday, November 17th, 1869, there was a great gathering for the official opening of the Canal, the central figure being the Empress of the French. Around her were gathered the Emperor Francis Joseph of Austria, the Crown Prince of Prussia, the Khedive, and a brilliant group of notabilities representing all interested nations. It was a final triumph for the Second Empire!

The Canal was, however, far from being perfect, much had yet to be done before it could be a satisfactory medium even for the comparatively small steamers of forty years ago; indeed the general expectation up to the time of opening seems to have been that the canal would serve as a barge route competing with the railway for the transport of goods which would be transhipped at its terminals; and until as late as the year 1883 the history of the Canal was somewhat chequered.

When successfully opened to ocean steamers, the narrowness of the waterway caused serious delays, nor was it until 1887, that by the use of searchlights fixed to the bows of steamers, the passage through the Canal could be continued by night as well as by day. The average time required for the passage from Port Said to Suez was at first about fifty-four hours. This has been reduced until at present the time required is only about one-third, namely, seventeen to eighteen hours. Just before the searchlight was employed, the average time occupied by the passage was thirty-four hours; with some five thousand ships passing through the Canal annually this one simple expedient has achieved a very considerable saving of time.

Tracing briefly the history of the Company, the shareholders during the construction of the Canal received annually interest at five per cent. on their shares; but as soon as the Canal was opened to traffic this ceased, and a dividend became contingent on profits, until the year 1875 there were no profits to divide. De Lesseps' original anticipations had been by no means fulfilled, and for some years the position of the Company was very shaky. One writer has put it on record that there was French management, polyglot proprietors, a mixture of French and Egyptian jurisdiction, Egyptian sovereignty, Turkish suzerainty, and British and Anglo-Indian traffic. "This together formed a commercial, moral, and political chaos as unprecedented as the work itself."

However, in the year 1875 a first dividend of five per cent. was earned, and profits have gradually and satisfactorily increased ever since, until at the present time the original £20 shares are worth about £220 each (June 1913), the result being that the four million pounds paid to the Khedive by the British Government in the year 1875, for his shares, has now increased in value until it figures in the nation's accounts at something over forty-six millions sterling.

In the year 1883 the shipping community were loud in their complaints as to the unsatisfactory manner in which the Canal was managed. Their interests were so far disregarded that they seriously contemplated raising sufficient capital to construct a rival canal. The final straw, which brought things to a crisis, was a sudden increase of the tolls charged. This increase amounted to about fifty per cent. on the former charges. The rate had been ten francs per net ton passing through the Canal. This was thought to be the legal maximum, but the Company, anxious to improve its financial position, determined, without reference to either users of the Canal or the Egyptian Government, to substitute gross tonnage for net. There was an immediate outcry, in consequence of which an International Commission was appointed to consider the questions at issue, and report. The outcome of this Commission's work was that the old tolls were retained, but a surtax of three francs per ton was chargeable until growth of tonnage passing through the Canal should warrant its gradual extinction. It was also decided to enormously improve the dimensions of the waterway. This work has been in hand at intervals ever since, with the result that whereas the original line of canal contained some dangerous curves, these have all been improved, and some eliminated altogether; and whereas the original dimensions in the smallest sections were seventy-two feet width at the bottom of the Canal, and one hundred and fifty feet at the surface, with a nominal depth of twenty-six feet (though in places it was little more than twenty feet); now (1913) the minimum depth is thirty-four and a half feet, the width at the bottom is one hundred and forty-seven feet, with a minimum width at the surface of two hundred and forty feet.

In the year 1885 the entire length of the Canal was lighted by electricity, and the following year the first uninterrupted passage was accomplished, the P. & O. Company's steamer *Carthage* passing through, partly during darkness, in the record time of eighteen hours.

The effects of these timely improvements have been very considerable. In the year 1885 the blocking of the Canal, through vessels either stranding or sinking, was no less than 4·3 per cent. of those passing through; this comparatively large percentage has been reduced to 1·7. There is a very efficiently organised system for dealing with accidents, and the passage through is worked on the block system, stations having been constructed about three miles apart. The Company has been efficiently and successfully managed, much capital has been sunk in making the working of the Canal thoroughly efficient, and with increasing facilities and lower tolls to shipping there have been increasing dividends for the shareholders. The original toll of ten francs per net ton, with a surtax of three francs, has been gradually reduced until it now (1914) stands at the comparatively low figure of six francs twenty-five centimes per net ton for loaded vessels, and three francs seventy-five centimes for vessels in ballast. Passenger steamers pay in addition ten francs per adult passenger. Steamers regularly passing through the Canal are now supplied with certificates of measurement by the Canal Company; this is a special measurement calculated in accordance with the regulations laid down by the Company. In the event of a steamer arriving at the Canal not possessing this certificate, she is given a measurement by the Canal officials.

The tonnage flying the British flag has always been conspicuously predominant, and even after the keen competition of recent years over sixty per cent. of the tonnage passing through is British.

The route through the Suez Canal effected a saving in the distance between London and Bombay of nearly 4500 nautical miles, the route round the Cape measuring 10,719 miles, whilst via Suez it was reduced to 6274; on the longer voyage to Yokohama a distance of 14,300 miles, a saving of over 3000 miles was effected: thus the sea route between the trading centres of Europe and Asia was lessened to the extent of somewhere between 3000 and 4000 nautical miles. The Canal route also opened up new possibilities of trading; steamers using it passed a series of ports conveniently situated for the distribution of cargo, which, prior to the opening of the Canal, had been taken to English ports. Thus the English entrepot trade was affected by the new route, but not to the extent that some people have imagined. Since 1871 peace has reigned over Western Europe, giving continental nations the opportunity to foster and develop trade and commerce. England had enjoyed unique advantages in this respect, thanks to which, during times of conflict among our neighbours, we had experienced a phenomenal, industrial and commercial development. It could not be expected that this exceptional state of affairs would continue permanently. Germany had her commercial ambitions, and these were quickened when unity was attained. The history of the consolidation of the German Empire is a powerful illustration of the *economic interpretation of history*. The framers of the *blood and iron policy* had the commercial and industrial advancement of the Empire clearly in their minds' eye. Prince Frederick Charles, after the fall of Metz, said in an address to the officers of his staff, "We have just conquered on the military field, we have now to fight and conquer in the industrial sphere."

The commercial policy of Napoleon III. had also affected our distributing trade even before the Canal was opened. The establishment of the Messageries Company, and the fostering of French banking and trading interests in China and the Far East had not only diverted the raw silk trade from England to France, which was the most noticeable effect of this policy, but meant that English importing houses would, as time went on, find that the conditions of trade were changing in the interests of economic distribution in many other directions. For instance, the great mart for Indian cotton was Liverpool, and continental spinners and weavers using this raw material had to attend sales in this country, until of recent years large shipments have gone direct to continental ports. The opening of the Canal may have hastened the change, but it was a change that was bound to have occurred even without the change of route. The greatest living authority on this trade—Sir Thomas Sutherland—has expressed the opinion "that if the Cape route had remained the only route to the East, the growth of population and wealth in other countries, the extension of railways and the establishment of foreign houses throughout the East, would have induced perhaps even a larger direct trade than exists at present between the East and the great ports on the Continent"—adding, "we think the great bulk of the trade which continental countries carry on via the Canal is new business which has arisen since the opening of that channel of communication."

Whether trade shall be carried on directly between any two ports depends on other things besides mere distance. The quantity of cargo to be shipped used to be one of the main factors. If there is but a small shipment of wool from Australia to a Mediterranean port, it may be more economical to bring that small parcel to London with a full cargo, and then tranship it to its destination, although by doing so the mileage traversed by the wool is considerably lengthened; should, however, the demand for wool increase in the district served by this Mediterranean port to the point at which there is such a quantity demanded as will from time to time load a ship, then most probably the transhipment trade will cease, and ships will go direct with the wool; as to this, however, there are other considerations which have to be taken into account. A new development tends to make Port Said a more important centre for transhipment. Wool for towns such as Mazamet in the South of France, is discharged there by ships bound for English ports, and is carried from Port Said to its destination by the Messageries Maritimes steamers. Until recently this wool would have been brought to England for transhipment. Of recent years, too, cold storage has been installed at Port Said, and quantities of frozen carcases, for Egyptian consumption, are discharged there by steamers on their way to Europe.

The transhipment trade in another way has also been considerably modified owing to the very economical working of the modern cargo steamer. It is found to be cheaper in some cases for quite a large vessel on arrival in Europe, with a cargo for different ports, to turn into a coaster for a time, doing the work of distribution, and so saving the cost of handling and transhipment. As to the English distributing trade, it is very difficult to estimate to what extent this has been affected by the opening of the Suez Canal. On some other points, however, its influence is obvious. Before the opening of the Canal, the distance to the Far East was great, nor was it possible to utilise steamers in these trades for cargo purposes; the sailing ship was a necessity. Other commercial facilities too were lacking. The submarine cable was only just coming into use in 1869. When a sailing ship left Europe she was practically in the hands of the Captain or the Agents at foreign ports, thus the owners had but a limited control, beyond laying down the main lines on which the voyage was to be made. These conditions, with their uncertainty and the attendant risks, restricted the trade of the Far East to, comparatively speaking, a few firms. The monopoly of the East India Company had, it is true, ceased, but there still existed a virtual monopoly, because the competition was so limited. The result of this was that rates of freight were high, business was restricted, and commodities were dear. To-day facilities in transport and communication, the Canal, the steamer and the telegraph, make the importer the ruling factor in deciding what shall be imported, and how it shall be sold; this is true of both the European and Far Eastern market. The full effect of this is that speculation has given place to genuine trade; indeed in this sphere, the tendency connected with all regular modern business, namely, that the possibility of speculation shall be gradually decreased and finally eliminated, is very much in evidence. That this would have been the case in time even without the construction of the Suez Canal is doubtless true. Not only, however, was the Canal an assisting factor in this very valuable development, but its effects in stimulating the evolution of the modern steamer, were very remarkable.

The North Atlantic trade may claim to have been the means of producing the first large ocean-going steamers, but it was the great impetus given to a very special kind of trade by the opening of the Suez Canal which made shipbuilders and owners redouble their efforts to produce a cargo steamer of moderate dimensions—a vessel which should be capable of visiting large numbers of ports under very different conditions, easy to handle, economical to run, capable of satisfying the modern demands of all civilised nations, for the largest possible variety of commodities produced in all parts of the world. This has led to the enormous increase of international trading of recent years, which has made it an economic possibility to construct larger and larger steamers. The situation has developed snowball fashion; with increasing trade there has been decreasing cost all along the line, cheaper transport and cheaper goods. The tonnage of shipping only gives an approximate idea of the enormous increase in trade, because shipping is so much more efficient than it was before; nor do statistics of values, imports and exports, give any idea of the real increase in trade. Values have decreased to such an extent, over a period of half a century, that the volume of imports and exports stated in money gives no adequate idea of the very great increase in the quantities shipped since the opening of the Suez Canal.

That event then may be looked upon as one of the great factors in the modern development, not only of business methods, but of the vehicles and facilities of trade and commerce. It has both directly and indirectly done much for the daily life of the people throughout a great part of the world, in helping to raise the standard of living and further the ends of civilisation. Nor have we yet seen the final effects of the improvements and progress then stimulated, for whilst a death-blow was dealt to the sailing ship, and the steamer was definitely substituted as the more effective agent for ocean transport, the evolution of ocean-going craft is by no means completed.

Politically, too, the Canal effected much. East and West were brought into closer touch, the awakening of the East was hastened, Japan was brought under the influence of European civilisation and western ideals. The awakening of Japan has reacted upon her greater neighbour, nor will the political effects of this be fully worked out for many a decade yet to come.

CHAPTER V

TRADE ROUTE DEVELOPMENTS FROM THE YEAR 1855

THE export and import trade of the United Kingdom since the middle of the nineteenth century shows a very remarkable development. In the year 1855 the total foreign trade of this country, excluding shipments of bullion, amounted to just over £260,000,000; for the year 1912 the figure had grown to nearly £1,232,000,000. During the same period, the tonnage, both British and foreign, entered and cleared at the ports of the United Kingdom increased from 18,500,000 to nearly 139,000,000. During that time great changes have taken place, not only in shipping, but in the character of the goods imported and exported, and the countries whence they come and to which they go.

Fifty years ago steamship tonnage was negligible, and is not differentiated in official returns from that of sailing ships. Of the total tonnage visiting our ports sixty years ago, fifty-nine per cent.[1] was English, and the most recent available figures show that that percentage is about the same, 59·77, showing a slight increase of ·7 per cent.

[1] *Cf.* Appendix No. 2.

But by looking at statistics for the intervening years, it will be noted that the percentage for English tonnage steadily increased, until during the 'seventies, 'eighties, and early 'nineties, if the whole[1] of the shipping entering the ports of the United Kingdom be reduced to terms of steamship tonnage (by reckoning one ton of a steamship as the equivalent of four tons of a sailing vessel) the percentage of English to foreign tonnage nearly reached eighty, being, in the year 1870, 79 per cent.; in 1880 it was 78·7 per cent., and in 1890 77.5 per cent. This was due to the enterprise of some British ship-owners who concentrated their efforts on the steamship, when other owners, especially foreigners, continued to rely on the sailing ship. During the last twenty years, however, the foreigner has steadily increased his holding of steam tonnage, and steamers flying the flag of Scandinavian countries and Germany have entered our ports in ever-increasing numbers. Nor is this due to their taking business from English bottoms, for to a great extent this increasing foreign tonnage is connected with new trades. Taking the year 1870, when the tonnage belonging to the United Kingdom made up 79 per cent. of the shipping visiting United Kingdom ports, the figure was just over 16,200,000 tons as against 4,190,000 tons of foreign shipping: between 1870 and 1911 the British figure had increased no less than 65,000,000 tons as against the foreign increase of 50,500,000 tons.

[1] *Cf.* Appendix No. 2.

Figures like these are of very considerable interest, especially if an analysis be attempted by means of which the security of the hold of British shipping on the transport trade of the world can be grasped. By means of a table such as that given in the appendix,[1] the countries with whom our volume of trade is greatest can easily be gathered, and it may also be used as an index to our most valuable trade routes. It must always, however, be remembered that ships belonging to the United Kingdom also perform very considerable services of transport in the inter-foreign trade. As has been pointed out already, about 20 per cent. of our tonnage is employed abroad, and but seldom or never visits the ports of the United Kingdom. This being the case, it is necessary to get a broad view of the principal spheres of ocean trade before going into the details of particular routes. Taking a bird's eye view of the trade of the world as a whole, one of the first things that attracts the attention is, that at present the great industrial and manufacturing centres are Western Europe—notably the United Kingdom and Germany, and the Eastern States of America. Thus, in two well-defined areas on the world's surface, the great mass of manufactured goods required by the rest of the world are produced. This work of manufacturing employs the whole labour of many millions of mankind, for whom other labour has to produce not only the raw materials out of which the finished

[1] *Cf.* Appendix No. 19.

goods are manufactured, but also the food supply required by this great industrial army. The great food producing countries now are North and South America, parts of Eastern Europe, and the countries of the Far East including Australia and New Zealand. This brief description raises several points of interest. North America is, on the east side, a hive of manufacturing industry, but also, as a whole, produces sufficient food, not only for itself —but in addition, a large quantity for export. Thence therefore there is a large trade in the export of manufactured goods and food stuffs.

The principal countries supplying raw materials are, North-western Europe, North and South America, India, China, Japan, and Australasia.

This enumeration of the main sources of exchanges in manufactured goods, raw materials and food stuffs, raises several points of absorbing interest. It has been described in a few lines in order that the attention may at once be directed, firstly, to the main routes which must obviously be taken by the shipping effecting the exchanges; and secondly, to the comparatively small number of points where the greatest amount of the world's shipping focusses. It will be realised at once by referring to the map, that the busiest water route in the world is the stretch of sea lying between the south of Ireland and Ushant, where the St George's Channel, the Bristol Channel, and the English Channel all merge in the Atlantic Ocean. For this waterway focusses the main part of the import and export trade of Western Europe, namely that of the United Kingdom, Germany, France, Holland, and the Scandinavian countries, the leading ship-owning countries in the world. This stretch of sea gives access to the chief European terminal ports, at which are concentrated the great shipping, industrial and manufacturing interests of the Old World.

This waterway leads to a number of smaller focussing points for the trade of the Old World, for the main trade route bifurcates, and other focussing points are, the Straits of Gibraltar, through which passes the greater part of the shipping employed in the Eastern trade; and Madeira, where steamers going either to or round the Cape of Good Hope separate from those bound to South American ports or round Cape Horn. The second great focussing point of the world's shipping routes lies between Cape Race and Long Island. Here are concentrated the routes, along which passes the greater part of the commerce between Canada and the United States on the one hand, Central and South America and Europe on the other. For all shipping leaving or entering the St Lawrence and the great north-east ports of the United States, including the greatest of them all —New York—must pass through this waterway.

With the opening of the Panama Canal there may be a third great focussing point of the world's commerce, perhaps destined to become of even greater importance than the other two; at present, however, the first-mentioned focussing point is the most important from every material point of view.

So far as the trade[1] between the United Kingdom and Europe is concerned, that with Germany comes first. And if the trade with Holland and Belgium be grouped with that of Germany (for it is impossible to even estimate to what extent the figures of these two countries are swollen by goods going through to, or coming through from, Germany), this trade has, throughout the period taken, amounted to a total unapproached by any other European country or group, and at present exceeds even the very considerable figure of our trade with the United States.

With France our trade has been steady and developing. In the year 1855 it reached nearly £20,000,000 in value, and during the period it has more than quadrupled.

With Russia our trade relations have been cordial with few exceptions, ever since the days when Richard Chancellor sailed into the White Sea and proceeded over land to interview the Czar at Moscow. By the year 1856 imports and exports amounted to the considerable value of nearly £15,000,000, placing Russia fourth in importance among the principal countries trading with the United Kingdom. There has been a steady growth, and the trade has since then rather more than quadrupled, the value for the year 1910 being over £64,500,000.

With Denmark, thanks to our demand for

[1] *Cf.* Appendix No. 19.

Danish dairy produce, the increase of trade has been phenomenal, the £4,000,000 of 1855 increasing to over £26,000,000. With Norway and Sweden, too, there has been an equally remarkable development of trade, less than £5,500,000 worth of imports and exports increasing to over £30,000,000 in fifty-five years.

The port of Hull especially has benefitted owing to this growing commerce with Scandinavia and the Baltic countries. The European trade requires a comparatively small, but very useful and profitable vessel. There may not be the same stateliness about the shipping entering the Humber that characterises the large liners of the Thames and Mersey, but the work of the less ornamental ship is no less necessary to our well-being; whilst the training for officers and men is second to none in the world.

Turning next to long distance voyages, the modern trade routes to the Far East and Australasia are of growing importance, not only as giving employment to a great amount of shipping tonnage, but as supplying both food and raw materials in large quantities and considerable variety. Of the trade which is now exclusively carried on through the Suez Canal, the figures for British India, including the Straits Settlements and Ceylon, show a fairly steady increase, the £26,000,000 of the year 1855 having swollen to the very satisfactory sum of over £128,500,000 in the year 1911; moreover, the fall in prices of Eastern commodities and manufactured goods must mean that the quantity of goods carried has increased even more considerably than the money value at first suggests. The trade with China, however (and with this has been included in the table, *cf.* Appendix No. 5, the figures for Hong Kong), has fluctuated very considerably. These fluctuations have undoubtedly been caused to a very great extent by our increased Indian trade. During the days of the tea clippers, the great bulk of the tea consumed in the United Kingdom came from China, but of recent years India and Ceylon have very successfully competed in this market, with the result that but little Chinese tea is now consumed in this country. The volume of our import and export trade with China has suffered considerably owing to this. In the year 1855 the total trade amounted in value to just over £10,000,000, and, so far as value is concerned, reached its maximum in the year 1876 with a total of nearly £23,750,000; from then it began to decrease until in 1890 the China trade fell to the twelfth place in importance, with a value of, in round figures, £15,500,000. Nor was this the lowest point reached, for seven years later the official figures show a further decrease of £5,000,000. From the year 1897, however, there has been a recovery, and although during the Boer troubles trade suffered, during the past decade there has been a steady increase, values rising from £12,350,000 in 1901 to over £20,000,000 in the year 1911.

What the modernising of Japan has meant to our trade can be seen by glancing at the table. In the year 1860 the total import and export trade of Japan with the United Kingdom only amounted to £167,000; the latest figures are considerably over £15,000,000.

The greatest increase in our Far Eastern trade, however, is with Australasia; here in less than sixty years there has been a ninefold increase, and the present volume of trade, over £103,000,000, shows healthy signs of continued growth. Special interest attaches to some of the commodities exported from Australia and New Zealand. In the year 1880 an experiment was tried to test the possibility of transporting frozen meat over the many thousands of miles separating Europe and Australia. For this purpose 400 sheep were prepared for shipment, and from this small beginning a great and growing industry has developed.[1] In the year 1883 a direct service of steamships between London and New Zealand was inaugurated; then trade in frozen meat and fruit, various kinds of food stuffs, wool, skins, and minerals has had a very great extension during the past thirty years. The refrigerating ships find cargoes not only in Australia but in South America, Argentina having developed an immense business in cattle and sheep. The routes traversed by the steamers carrying on these trades are traced on the map at the end of this volume. The business has been subject to great competition, but at present the policy

[1] *Cf.* Appendix No. 3.

of conferences has produced greater regularity of service and steadiness in rates of freight. In addition to the regular mail and passenger liners, there are a number of fine cargo steamers, which may perhaps be termed cargo liners, wholly or partially engaged in these trades.

In order that the general reader may appreciate the services rendered by these cargo steamers the following chapter, the reading of which may be omitted by those versed in the subject, sets forth a series of voyages actually performed by some of these vessels during the past seventeen years. Beginning about the year 1896, twenty-four voyages between the United Kingdom, Australasia, South America, and South Africa are recorded. The details given relate in a general way to the cargo carried, the number of nautical miles between the ports, and the time required to cover this distance. In a few instances the actual consumption of coal is also noted. These figures are of considerable interest, and may be utilised in many directions. The effect of using different qualities of coal is clearly shown, and the advantages connected with some of the world's coaling stations are apparent.

Some practical lessons too in the economics of coaling may be learned from the figures, and from the brief notes which illustrate some of the voyages.

Very vague ideas are held as to the amount of coal consumed by an average cargo steamer. For instance, in a semi-official pamphlet on the Panama

Canal one reads: "It is said that a dollar per ton of freight per thousand miles represents the coal consumption of the slow-going freight steamer. In other words, every dollar per ton which we charge as tolls for the Canal will neutralise a thousand miles of the advantage in distance which the Panama route may have over any competitor."

Not only does the writer of the pamphlet ignore other expenses than coal in working a steamer, but he places the cost of coal far too high. One of the steamers among those about to be quoted has a carrying capacity of 10,400 tons. On an average she steams 4½ nautical miles for every ton of coal consumed. At the price of £1 per ton for coal this would give in round figures *five pence*, and not one dollar, as the cost of coal for carrying one ton of goods one thousand miles. The figure quoted in the pamphlet is really grotesque: if the cost of coal were anything approaching it, the steamer would never have been able to oust the sailing ship from any trades. With the present (1913) freight on wool from Australia, namely five-eighths of a penny per pound, which works out at about 28s. per 40 cubic feet, or one ton measurement, the charge for carrying wool by steamer via the Suez Canal is only about 2s. 4d. per ton per thousand miles, and for grain from Australia with freights at 35s. the charge for transport is about 2s. 11d. per ton for a thousand miles. And be it remembered shipping at the present moment is passing through a period of exceptional prosperity.

CHAPTER VI

TWENTY-FOUR TRADING VOYAGES (1896-1913)

Voyage 1

The voyages begin in the middle of the year 1896. The first steamer was built in the year 1891, and was consequently five years old when the record begins. She measured 3738 tons gross, 2429 net, carrying capacity 6500 tons. Her hull was of steel, her engines triple expansion, working at a pressure of 160 lbs., and she was fitted with refrigerating machinery for the carriage of frozen meat. Crew of 42 hands.

Left.		Arrived.	
May 2	London	Teneriffe	May 9
,, 9	Teneriffe	Fremantle	June 17
Aug. 9	Fremantle	Albany	Aug. 10
,, 18	Albany	Sydney	,, 24
Sept. 19	Sydney	Wellington	Sept. 26
,, 27	Wellington	St Vincent	Nov. 10
Nov. 10	St Vincent	Teneriffe	,, 14
,, 15	Teneriffe	Havre	,, 22
,, 28	Havre	London	,, 29

Remarks.—Took a general cargo from London to Fremantle, then loaded Karri wood blocks for London street paving at Albany. Went to Newcastle N.S.W. for coal and loaded some frozen meat there. Completed loading at Sydney with meat, wheat and wool. Part of the meat was for Havre, the remainder for London. Wellington, St Vincent and Teneriffe called at in order to replenish bunkers.

VOYAGE 2

Left.		Arrived.	
Jan. 21	London	Las Palmas	Jan. 28
,, 28	Las Palmas	Fremantle	Mar. 7
Mar. 26	Fremantle	Albany	,, 27
Apr. 3	Albany	Brisbane	Apr. 11
,, 24	Brisbane	Sydney	,, 26
May 8	Sydney	La Plata	June 9
June 16	La Plata	St Vincent	July 3
July 4	St Vincent	Teneriffe	,, 8
,, 8	Teneriffe	London	,, 16

Remarks.—Took out a general cargo to Western Australia; loaded Karri wood at Albany for London. Coaled at Newcastle N.S.W. while *en route* from Sydney to Brisbane. Loaded frozen produce at Brisbane and Sydney and called at the River Plate for live oxen and sheep.

Voyage 3

Second Steamer.—Built 1896. Measurements: 5490 tons gross, 3554 net, carrying capacity 9000 tons. Her hull was of steel, her engines triple expansion working at a pressure of 160 lbs., and she was fitted with refrigerating machinery. Crew of 54 hands.

Left.		Arrived.	
Aug. 14	London	Las Palmas	Aug. 21
,, 21	Las Palmas	Fremantle	Sept. 28
Oct. 26	Fremantle	Albany	Oct. 26
,, 29	Albany	Port Pirie	Nov. 3
Nov. 24	Port Pirie	Newcastle N.S.W.	,, 24
Dec. 1	Newcastle N.S.W.	Sydney	Dec. 2
,, 9	Sydney	Melbourne	,, 12
,, 18	Melbourne	La Plata	Jan. 21
Jan. 26	La Plata	St Vincent	Feb. 19
Feb. 20	St Vincent	Las Palmas	,, 24
,, 24	Las Palmas	London	Mar. 4
Mar. 16	London	Antwerp	,, 18

Remarks.—Took a general cargo out to Fremantle and Albany. Went in ballast to Port Pirie. Loaded 3000 tons of ore at Port Pirie, and took in frozen produce at Newcastle N.S.W., Sydney and Melbourne. Called at La Plata for 600 live bullocks and 2000 live sheep. Cost of coal averaged about 5s. per ton more at St Vincent than at Las Palmas.

VOYAGE 4

Left.		Arrived.	
May 2	London	Fremantle	June 17
July 8	Fremantle	Albany	July 9
,, 15	Albany	Sydney	,, 22
,, 27	Sydney	Brisbane	,, 29
Aug. 3	Brisbane	Sydney	Aug. 6
,, 16	Sydney	Wellington	,, 22
,, 23	Wellington	Las Palmas	Oct. 8
Oct. 8	Las Palmas	London	,, 16

Remarks.—Took a general cargo out to Western Australia. Loaded Karri wood at Albany for London. Coaled at Sydney, Bulli and Belambi coal. Loaded frozen produce at Sydney and Brisbane. On homeward voyage coaled at Wellington and Las Palmas.

VOYAGE 5

Left.		Arrived.	
Nov. 5	London	New York	Nov. 18
Dec. 11	New York	St Vincent	Dec. 24
,, 25	St Vincent	Adelaide	Feb. 3
Feb. 7	Adelaide	Melbourne	,, 9
,, 16	Melbourne	Sydney	,, 18
,, 23	Sydney	Newcastle	,, 23
,, 26	Newcastle	Brisbane	,, 28
Mar. 3	Brisbane	Sydney	Mar. 5
,, 10	Sydney	Melbourne	,, 12
,, 19	Melbourne	La Plata	Apr. 19
Apr. 27	La Plata	St Vincent	May 15
May 15	St Vincent	Las Palmas	,, 19
,, 20	Las Palmas	London	,, 28

Remarks.—Went in ballast across the Atlantic.

At New York loaded a general cargo, principally *Yankee Notions*, for Australian ports. At these Australian ports as cargo was landed, frozen produce was taken on board for London. The ship coaled in Sydney with Bulli and Belambi coal. On the way home called at La Plata for a deck-load of live bullocks and sheep.

Voyage 6

Third Steamer.—Built 1897. Measurements: 5489 tons gross, 3546 net, carrying capacity 9000 tons. Steel hull, triple expansion engines working at 160 lbs. pressure; fitted with refrigerating machinery. Crew of 54 hands.

Left.		Arrived.	
Aug. 13	London	New York	Aug. 25
Sept. 9	New York	St Vincent	Sept. 22
,, 23	St Vincent	Melbourne	Nov. 5
Nov. 11	Melbourne	Geelong	,, 11
,, 15	Geelong	Sydney	,, 17
,, 28	Sydney	Newcastle	,, 28
,, 30	Newcastle	Brisbane	Dec. 2
Dec. 8	Brisbane	Sydney	,, 10
,, 16	Sydney	Melbourne	,, 19
,, 28	Melbourne	Adelaide	,, 30
Jan. 1	Adelaide	Albany	Jan. 6
,, 7	Albany	London	Feb. 28

Remarks—Went in ballast across the Atlantic. At New York loaded a general cargo for Australian ports. Commenced loading frozen produce at Geelong, continuing at Sydney, Newcastle N.S.W., Brisbane, Melbourne, and completed at Adelaide. Came home round the Cape of Good Hope without calling anywhere.

VOYAGE 7.—*Same Steamer*

Left.		Arrived.		Nautical Miles.	Coal Consumption (Tons).		Miles run per 1 ton Coal consumed.
April 3	London	Capetown	Apr. 28	6,210	W.	1114	5·57
May 2	Capetown	Melbourne	May 27	6,046	W.	1023	5·91
June 5	Melbourne	Sydney	June 9	587	W.	118	5
,, 13	Sydney	Bowen	,, 18	993	W. & S.	182	5·4
,, 23	Bowen	Gladstone	,, 25	302	W. & S.	61	4·95
,, 28	Gladstone	Brisbane	,, 30	310	S.	75	4·1
July 5	Brisbane	Sydney	July 7	501	W. & S.	89	5·6
,, 14	Sydney	Albany	,, 24	1,837	S.	421	4·36
,, 25	Albany	Capetown	Aug. 22	5,367	S.	1266	4·24
Aug. 30	Capetown	St Vincent	Sept. 17	3,952	N.N.	790	5
Sept. 17	St Vincent	Las Palmas	,, 22	867	W.	220	3·9
,, 22	Las Palmas	London	Oct. 1	1,704	W.	410	4·15
		Total	run . .	28,676	Total .	5769	

Giving an average of 4·97 miles run for each ton of coal consumed.

Remarks.—The outward voyage from London to Capetown was with troops for the Boer War.

NOTE.—The letters before coal quantities:—W. = Welsh; S. = Southern; N.N. = Natal Navigation; Bris. = Brisbane.; A. = Australian; W. & A. = Welsh and Australian mixed; B. & B. = Bulli and Belambi. (Of Australian coal the best for steam purposes are Mount Kembla, Bulli, and Belambi. These three are known as *Southern Coal*, and are obtained at three small coaling ports about sixty miles south of Sydney.)

VOYAGE 8.—*Same Steamer*

Left.		Arrived.		Nautical Miles.	Coal Consumption (Tons).	Miles run per 1 ton Coal consumed.
Nov. 10	London	Las Palmas	Nov. 18	10,986	W. 310	5·90
,, 18	Las Palmas	Fremantle	Dec. 28		W. 1550	
Jan. 14	Fremantle	Adelaide	Jan. 20	1,359	W. 245	5·45
,, 26	Adelaide	Geelong	,, 29	503	W. & A. 111	4·5
Feb. 1	Geelong	Newcastle	Feb. 4	630	W. & A. 114	5·5
,, 7	Newcastle	Brisbane	,, 10	425	S. 103	4·12
,, 14	Brisbane	Sydney	,, 16	480	S. 53 Bris. 90	3·35
,, 23	Sydney	Albany	Mar. 3	1,840	S. 377	4·88
Mar. 4	Albany	Fremantle	,, 5	340	S. 59	5·76
,, 6	Fremantle	Durban	,, 27	4,550	S. 1012	4·49
April 3	Durban	Capetown	April 6	860	N.N. 150	5·73
,, 15	Capetown	Las Palmas	May 4	4,412	N.N. 800	5·51
May 5	Las Palmas	London	May 12	1,705	W. 323	5·21
		Total	run . .	28,090	Total . 5297	

Average 5·3 nautical miles run per ton of coal consumed.

VOYAGE 9

Left.		Arrived.	
June 2	London	North Shields	June 3
,, 12	North Shields	Halifax N.S.	,, 24
,, 27	Halifax N.S.	New York	,, 29
July 25	New York	St Vincent	Aug. 7
Aug. 8	St Vincent	Adelaide	Sept. 20
Sept. 25	Adelaide	Melbourne	,, 27
Oct. 2	Melbourne	Sydney	Oct. 5
,, 16	Sydney	Newcastle	,, 16
,, 17	Newcastle	Brisbane	,, 19
,, 24	Brisbane	Gladstone	,, 25
,, 27	Gladstone	Broadmount	,, 27
,, 28	Broadmount	Bowen	,, 29
Nov. 7	Bowen	Pinkenba	Nov. 10
,, 12	Pinkenba	Sydney	,, 14
,, 16	Sydney	Durban	Dec. 18
Jan. 4	Durban	Capetown	Jan. 8
,, 26	Capetown	Sydney	Feb. 28

Remarks.—The steamer this voyage coaled at the Tyne, and then went to Halifax N.S. expecting to be required there as a transport for troops. Not being taken up for trooping, she went on to New York and loaded a general cargo for Australian ports. The itinerary is interesting as showing how a comparatively large steamer can advantageously call at a number of ports for the purpose of unloading part cargo, and gradually fill up with homeward freight.

This steamer went on from Sydney to Auckland, and conveyed troops thence to South Africa. The captain who had charge of the ship from London left her in Sydney, and took charge of another steamer there about twelve months later.

VOYAGE 10

Fourth Steamer.—Built 1899. Measurements: 5527 tons gross, 3548 tons net, carrying capacity 9000 tons. Steel hull, triple expansion engines working at 160 lbs. pressure; fitted with refrigerating machinery. Crew of 52 hands all told.[1]

Left.		Arrived.	
Jan. 31	Sydney	Port Chalmers	Feb. 6
Feb. 11	Port Chalmers	Lyttelton	,, 12
,, 12	Lyttelton	Wanganui	,, 13
,, 14	Wanganui	Napier	,, 15
,, 16	Napier	Gisbourne	,, 17
,, 18	Gisbourne	Wellington	,, 19
,, 23	Wellington	Sydney	Mar. 1
Mar. 6	Sydney	Fremantle	,, 16
,, 16	Fremantle	Durban	Apr. 3
Apr. 18	Durban	Port Elizabeth	,, 19
,, 22	Port Elizabeth	Capetown	,, 24
May 2	Capetown	Buenos Ayres	May 19
,, 22	Buenos Ayres	Campana	,, 24
June 4	Campana	Buenos Ayres	June 5
,, 25	Buenos Ayres	Capetown	July 12
July 22	Capetown	Durban	,, 26
Aug. 4	Durban	Buenos Ayres Roads	Aug. 26
Sept. 1	Buenos Ayres Roads	Campana	Sept. 2
,, 21	Campana	Buenos Ayres	,, 23
,, 30	Buenos Ayres	Capetown	Oct. 15
Oct. 24	Capetown	Durban	,, 30

[1] Crew consisted of—Master, 4 officers, bo'sun, carpenter, lamp-trimmer, doctor, 12 A.B.'s, 4 engineers for main engines, 2 engineers for refrigerating engines, 1 donkeyman, 1 storekeeper, 3 greasers, 12 firemen and trimmers, 3 cooks, 5 stewards.

Remarks.—This voyage is interesting. The steamer called at six New Zealand ports picking up frozen produce at each, taking seventeen days over the work. Twelve saloon and fifty steerage passengers joined her in New Zealand for South Africa.

From Capetown on June 4 she went in ballast to Buenos Ayres. At Campana she loaded frozen beef, and at Buenos Ayres maize and horses for South Africa, and returned to Buenos Ayres in ballast, repeating her previous voyage. This steamer, prior to the work here recorded, had taken troops from England to South Africa in the year 1901, and was for some time engaged in carrying troops between South Africa and Australia. After the war she was employed carrying meat to South Africa as above.

VOYAGE 11

Fifth Steamer.—Built 1902. Measurements: 7530 tons gross, 4831 tons net, carrying capacity 11,000 tons. Steel hull, triple expansion engines working at 180 lbs. pressure; fitted with refrigerating machinery. Crew of 80 hands all told.

Left.		Arrived.	
Nov. 4	Durban	Albany	Nov. 21
,, 21	Albany	Sydney	,, 28
Dec. 5	Sydney	Bowen	Dec. 9
,, 13	Bowen	Broadmount	,, 14
,, 16	Broadmount	Brisbane	,, 23
Jan. 5	Brisbane	Sydney	Jan. 7
,, 9	Sydney	Melbourne	,, 11
,, 17	Melbourne	Durban	Feb. 8
Feb. 14	Durban	Capetown	,, 17
,, 25	Capetown	Las Palmas	Mar. 12
Mar. 12	Las Palmas	London	,, 19

Remarks.—This steamer had been trading between New York and Australia for about a year when this record commences. She went in ballast from Durban on November 4th to Albany and on to Sydney. There and at Bowen and Broadmount she loaded frozen meat and rabbits, and at Brisbane loaded frozen beef. At Sydney and Melbourne she loaded wool, skins, wheat and frozen produce. Discharged some meat at the Cape and replenished her bunkers with coal.

VOYAGE 12

This same steamer went from London to Glasgow, thence to Avonmouth, where she loaded about 3000 tons of galvanized iron and 500 tons of cocoa, thence to Liverpool where she took in about 3000 tons of iron, 1000 tons of whisky and beer, and about 2000 tons measurement fine goods. From Liverpool she sailed with cargo and passengers for Australian and New Zealand ports. At Adelaide she commenced taking in frozen produce for the return voyage, and gradually filled up at the various ports at which she touched. More than half the frozen meat was discharged in South Africa; thus from Capetown home she was only partially loaded. The voyage extended from May 1st to October 21st, going outward via Las Palmas and the Cape of Good Hope. The Australian ports touched at were Adelaide, Melbourne and Sydney, thence across to Auckland, calling at six New Zealand ports, viz. Auckland, Wellington, Lyttelton, Port

Chalmers, Timaru and Bluff. Then across to Tasmania, calling at Hobart, thence to Western Australia (Fremantle) and home via Durban, Capetown and Las Palmas.

Voyage 13

Same Steamer.—

Left.		Arrived.	
Dec. 2	London	Adelaide via Capetown	Jan. 16
Jan. 20	Adelaide	Melbourne	,, 22
,, 24	Melbourne	Sydney	,, 26
Feb. 4	Sydney	Brisbane	Feb. 6
,, 8	Brisbane	Bluff	,, 13
,, 17	Bluff	Lyttelton	,, 18
,, 22	Lyttelton	Wellington	,, 23
,, 25	Wellington	Napier	,, 26
,, 27	Napier	Gisbourne	,, 28
Mar. 1	Gisbourne	Auckland	Mar. 2
,, 5	Auckland	Monte Video	,, 27
,, 28	Monte Video	Las Palmas	Apr. 16
Apr. 17	Las Palmas	London	,, 24

Remarks.—This voyage offers a variety, in that the return is via New Zealand ports where a full cargo was collected, and then only one stop was made, at Monte Video, in order to replenish bunkers. On the outward passage 24 saloon and 250 steerage passengers were carried, the cargo was very much the same as on voyage 12.

Voyage 14

On this voyage the steamer went round from London to Glasgow, where she was overhauled and her masts and funnel were altered so that she might go up the Ship Canal to Manchester. In order to pass under the bridges, the masts have to be shortened and the funnel is jointed so that while the ship is in the Canal the top part of the funnel can be disconnected. The outward cargo was loaded at four ports—Glasgow, Avonmouth, Manchester and Liverpool. At Liverpool 30 saloon and 200 steerage passengers were embarked. The cargo was of the same description as on the previous voyages, with the exception that by going up to Manchester the ship secured about double the quantity of fine measurement goods she otherwise would have. This point is worth noting in connection with more recent developments at the Port of Manchester. The usual Australian and New Zealand ports were visited and a full cargo of the usual description was loaded. The homeward voyage was by way of South Africa, Durban, Algoa Bay and Capetown, where the greater part of the frozen produce was discharged. The saloon was full of passengers to England. The time occupied by the voyage out and home was from June 10th to November 18th.

Voyage 15

This extended from January 11th to June 14th. The usual Australian and New Zealand ports contributed to the homeward cargo. The return passage was via Cape Horn, the steamer touching at Monte Video to replenish her bunkers.

Voyage 16

This is of rather considerable interest. The outward voyage terminated at Brisbane. The return cargo consisted mainly of frozen produce and wool; the latter bulked most largely. A new regulation had been drawn up by the wool shippers, in accordance with which wool ships must return home via the Suez Canal. Also it should be noted that on the homeward voyage frozen meat was landed both at Port Said and Gibraltar.

After taking in cargo at London, Avonmouth and Manchester, the vessel left Liverpool on August 18.

Left.		Arrived.	
Aug. 18	Liverpool	Las Palmas	Aug. 24
,, 24	Las Palmas	Adelaide	Sept. 30
Oct. 3	Adelaide	Melbourne	Oct. 5
,, 9	Melbourne	Sydney	,, 11
,, 17	Sydney	Newcastle N.S.W.	,, 17
,, 20	Newcastle N.S.W.	Brisbane	,, 22
,, 31	Brisbane	Sydney	Nov. 2
Nov. 3	Sydney	Melbourne	,, 6
,, 10	Melbourne	Portland	,, 11
,, 12	Portland	Adelaide	,, 13
,, 20	Adelaide	Port Said	Dec. 21
Dec. 22	Port Said	Gibraltar	,, 30
,, 30	Gibraltar	Manchester	Jan. 6
Jan. 12	Manchester	Liverpool	,, 12
,, 15	Liverpool	London	,, 20

Voyage 17

Extended from March 30th to August 11th. The ship went both out and home via the Cape of Good Hope. The outward cargo was of the same description, and loaded at the same ports as before. The homeward cargo, which was entirely from Australian ports, consisted of frozen produce and wheat. Durban was the coaling port homewards.

VOYAGE 18

Sixth Steamer.—Built 1899. Measurements: 5890 tons gross, 3843 tons net, carrying capacity 9000 tons. Steel hull, triple expansion engines working at 160 lbs. pressure; fitted with refrigerating machinery. Crew of 52 hands all told.

Left.		Arrived.	
Aug. 22	Liverpool	Madeira	Aug. 28
,, 28	Madeira	Auckland	Oct. 18
Oct. 24	Auckland	Napier	,, 26
,, 28	Napier	Wellington	,, 29
Nov. 3	Wellington	Lyttelton	Nov. 4
,, 6	Lyttelton	Dunedin	,, 7
,, 11	Dunedin	Sydney	,, 16
,, 21	Sydney	Melbourne	,, 23
Dec. 4	Melbourne	Kingston	Dec. 5
,, 9	Kingston	Adelaide	,, 10
,, 16	Adelaide	Port Said	Jan. 18
Jan. 18	Port Said	Dunkirk	,, 30
Feb. 4	Dunkirk	London	Feb. 4

Remarks.—This steamer carried general cargo together with 12 saloon and 300 steerage passengers to New Zealand ports. Then crossed from Dunedin to Sydney in ballast, and loaded principally wool in Australian ports for Europe. The homeward voyage was by way of the Suez Canal; and it is of interest to note that some cargo was discharged at Port Said for French Mediterranean ports.

Voyage 19

Seventh Steamer.—Built 1906. Measurements: 4484 tons gross, 2843 tons net, carrying capacity 7300 tons. Steel hull, triple expansion engines working at 200 lbs. pressure; fitted with refrigerating machinery. Crew of 43 hands all told. This voyage is of the ordinary type. The steamer was in Avonmouth in September 1909, she steamed to Barry and took in 2700 tons of bunker coal, then went round to Middlesborough for 1200 tons of rails, thence to London, and finished loading with general cargo. The outward voyage was via the Cape of Good Hope to Australian ports. At Port Pirie she loaded 3000 tons of concentrates as stiffening, and took a full cargo of wool at Sydney and Melbourne. The homeward voyage was via the Suez Canal, and owing to the coal strike in Australia it was impossible to obtain sufficient coal to take the ship to Port Said, hence it was necessary to touch at Colombo to replenish the bunkers. The voyage extended from October the 28th to March the 20th.

Voyage 20

This same steamer took in 2500 tons bunker coal at the Tyne, then loaded 2500 tons of rails at Middlesborough and completed loading with general cargo at London for Australian ports. The homeward cargo consisted of ore, and as there was no wool, it was not necessary to return via the Suez Canal. A call was made at Mauritius owing to some damage to one of the cylinders of the main engines. The ship replenished her bunkers at Durban, and continued the voyage to Dunkirk and Glasgow via the Cape and Las Palmas.

Voyage 21

This same steamer had a new cylinder fitted at Glasgow; took in some bar, sheet, and pig iron, and 2400 tons of bunker coal. She then steamed to Liverpool, loaded a large quantity of iron and some general cargo. The loading was finished at Avonmouth where she took in about 100 tons of cocoa and 1200 tons of galvanized iron. Of the whole cargo, two-thirds consisted of iron in various forms. The usual Australian ports were visited, and Hobart. A full cargo of wool was loaded and the homeward voyage was therefore by way of the Suez Canal. The duration of this voyage was from December the 9th to April 13th.

VOYAGE 22

Left.		Arrived.		Distance in Nautical Miles.	Coal consumed.	Miles run per 1 ton Coal.
May 7	London	Fremantle	June 18	10,919	1,760 W.	6·2
July 6	Fremantle	Bunbury	July 7	118	25 W. & W.A.	4·7
,, 11	Bunbury	Flinders Bay	,, 12	122	25 ,,	4·88
,, 21	Flinders Bay	Melbourne	,, 27	1,500	283 ,,	5·3
,, 31	Melbourne	Sydney	Aug. 2	579	97 ,,	5·8
Aug. 8	Sydney	Bahia Blanca	Sept. 3	6,916	1,258 Wallarah	5·49
Sept. 13	Bahia Blanca	Buenos Ayres	,, 15	551	109 ,,	5·05
Oct. 12	Buenos Ayres	Durban	Oct. 28	4,466	641 ,, & W.	6·9
,, 31	Durban	Mauritius	Nov. 5	1,553	242 Natal	6·4
Nov. 7	Mauritius	Calcutta	,, 18	3,231	453 ,,	7·1
Dec. 9	Calcutta	Colombo	Dec. 14	1,260	199 W. & Indian	6·3
,, 15	Colombo	Port Said	,, 28	3,402	555 W. & Natal	6·13
,, 29	Port Said	Gibraltar	Jan. 7	1,921	360 W.	5·3
Jan. 8	Gibraltar	Boston	,, 22	3,138	683 W.	4·5
Feb. 3	Boston	New York	Feb. 4	295	57 Pocahontas	5·1

Mar. 2	New York	St Vincent	Mar. 14	2,933	550 Pocahontas	5·3
,, 15	St Vincent	Capetown	,, 30	3,959	680 W.	5·8
April 2	Capetown	Fremantle	Apr. 21	4,806	770 Natal	6·2
,, 26	Fremantle	Adelaide	May 2	1,420	227 N. & W. A.	6·2
May 4	Adelaide	Melbourne	,, 6	515	92 Wallarah	5·5
,, 11	Melbourne	Sydney	,, 13	582	90 ,,	6·4
,, 16	Sydney	Brisbane	,, 18	496	83 ,,	5·9
,, 23	Brisbane	Port Pirie	,, 29	1,620	275 ,,	5·8
June 6	Port Pirie	Brisbane	June 13	1,627	310 ,,	5·2
,, 22	Brisbane	Sydney	,, 24	517	88 ,,	5·8
,, 29	Sydney	Melbourne	July 2	575	100 ,,	5·9
July 6	Melbourne	Albany	,, 12	1,351	260 ,,	5·1
,, 12	Albany	Durban	Aug. 1	4,569	954 Southern	4·78
Aug. 2	Durban	Las Palmas	,, 24	5,231	1,080 Natal	4·8
,, 26	Las Palmas	Dunkirk	Sept. 1	1,657	337 W.	4·9
Sept. 8	Dunkirk	London	,, 8	104	24 W.	4·3
				71,923	12,667	

Giving an average of 5·67 knots run per 1 ton of coal consumed.

Remarks.—This steamer dry docked and coaled at Cardiff, went to Middlesborough for rails, and completed loading with general cargo at London for Fremantle. From Fremantle she went in ballast to Bunbury to take in Jarrah wood, a further quantity being loaded at Flinder's Bay. At Melbourne 3000 tons measurement of Harvesters was loaded for Bahia Blanca. At Sydney bunkers were filled. At Buenos Ayres she loaded grain for Mauritius and Calcutta, and from Calcutta took jute and seed to Boston and New York, coaling *en route* at Colombo, Port Said and Gibraltar. At New York she loaded a general cargo for Australian ports, calling at St Vincent and Capetown for coal. The last of the American cargo was discharged at Brisbane. The ship then went to Port Pirie for ore, then returned to Brisbane and the other ports for the usual cargo. At Albany, Durban and Las Palmas she took in bunker coal.

VOYAGE 23

New twin-screw steamer built at Port-Glasgow. She was launched in February 1912 and completed for sea by May the same year. Measurements: 7759 tons gross, 4873 tons net, carrying capacity 10,400 tons. Quadruple expansion engines working at 220 lbs. pressure. The crew consists of: master, 5 officers, doctor, purser, 2 carpenters, bo'sun, lamp-trimmer, 3 cadets, 16 A.B.'s, 3 cooks, 9 stewards, 6 engineers, 2 refrigerating engineers, donkeyman, storekeeper, 4 greasers, 20 firemen and trimmers—77 hands all told. If emigrants are carried the number of A.B.'s is increased to 30, and about 30 extra stewards would be required.

Before leaving Glasgow she loaded about 1000 tons of cargo and 1700 tons bunker coal. She then steamed to Liverpool where 1200 tons more cargo was taken on board, then on to Avonmouth. It had been intended to complete the cargo in London, but the Dock Strike was in progress. Thus the loading was completed at Avonmouth and 676 emigrants for Western Australia were taken on board. The voyage out was via the Cape. The homeward cargo consisted of ore and wool, thus the voyage was made via the Suez Canal. One point of special interest is that the ship went to Dunkirk twice to discharge ore. It was more advantageous to run a large steamer like this across to Dunkirk from Tilbury than to discharge the cargo at Tilbury and send it to its destination by smaller craft.

Left.		Arrived.		Distance steamed, Nautical Miles.	Coal Consumed.	Miles run per Ton of Coal.
June 19	Avonmouth	Las Palmas	June 24	1,557	324 Scotch	4·83
„ 25	Las Palmas	Capetown	July 10	4,447	969 do. & W.	4·6
July 11	Capetown	Fremantle	„ 27	4,776	1,088 do. & N.	4·4
Aug. 19	Fremantle	Albany	Aug. 21	359	..	..
„ 21	Albany	Wallaroo	„ 24	1,019	..	..
„ 28	Wallaroo	Port Pirie	„ 28	70	..	..
Sept. 4	Port Pirie	Sydney	Sept. 8	1,149	..	..
„ 17	Sydney	Adelaide	„ 21	976	263 B. & B.	3·7
„ 27	Adelaide	Port Said	Oct. 24	7,562	1,763	4·28
Oct. 24	Port Said	Dunkirk	Nov. 4	3,200	659	4·8
Nov. 7	Dunkirk	Tilbury	„ 7	98	20	5
„ 9	Tilbury	Dunkirk	„ 10	98	20	5
„ 16	Dunkirk	Glasgow	„ 18	678	114	5·9
				25,989		

Voyage 24

This same steamer commenced loading at Glasgow and Liverpool. Then steamed to the Bristol Channel, coaled at Newport (Mon.), crossed over to Avonmouth, took in more cargo and proceeded to London, where the loading was completed and a large number of emigrants for Western Australia were embarked. The chief interest in the record is the distance run and the amount of coal consumed.

Left.		Arrived.		Distance steamed, Nautical Miles.	Coal Consumed.	Miles run per Ton of Coal.
Dec. 24	London	Capetown	Jan. 15	6,148	1,275	4·82
Jan. 16	Capetown	Fremantle	Feb. 2	4,744	1,101	4·30
Feb. 20	Fremantle	Albany	„ 21	339	72	4·7
„ 22	Albany	Port Pirie	„ 26	1,065	197	5·40
Mar. 11	Port Pirie	Wallaroo	Mar. 12	70	29	2·4
„ 20	Wallaroo	Albany	„ 23	1,014	211	4·85
„ 26	Albany	Fremantle	„ 27	348	87	4·0
„ 28	Fremantle	Durban	Apr. 4	4,376	1,059	4·14
Apr. 13	Durban	Las Palmas	May 1	5,272	1,178	4·46
May 1	Las Palmas	Tilbury	„ 8	1,704	360	4·73
„ 8	Tilbury	Hull	„ 9	..	..	..
„ 17	Hull	Dunkirk	„ 17	..	..	..
„ 24	Dunkirk	London	„ 24	..	..	..
				25,080	5,569	

Giving an average during the voyage of 4·5 knots per ton of coal consumed.

CHAPTER VII

PRINCIPAL MAIL ROUTES

THE routes followed by the mail steamers to the Far East and Australia are via the Mediterranean and Suez Canal to Colombo, calling at Gibraltar, Malta, either Naples or Brindisi, Port Said, Suez, Aden, Colombo, then down the Indian Ocean, passing the Cocos Islands, to Fremantle or Perth, across the great Bight to Adelaide (South Australia), Melbourne (Victoria), and Sydney (New South Wales.) Either Sydney or Brisbane is the terminus for the mail steamers. From Adelaide at present (1914) the mails go by rail to Melbourne, Sydney, Newcastle, Brisbane and other towns. When the railway is connected up with the Western Australian ports the entire mail will be landed at Fremantle or Perth. From the Australian ports there are local steamship lines connecting with all the ports of Australia proper, and also with Tasmania, New Zealand, and the neighbouring islands.

The mail steamers for India, China, and Japan cross either from Aden direct to Bombay, or, touching at Colombo, proceed to Calcutta. Others proceed from Colombo to Penang, and Singapore, and thence either to Manila and Japanese ports, or to Hong Kong, and Shanghai, and thence to Japan.

The westward route to the Far East and Australia entails crossing the Atlantic, and then making use of either the Canadian or United States transcontinental railways to Vancouver, Seattle, or San Francisco. From Vancouver steamers run direct to Yokohama, and also via Honolulu to New Zealand and Australia. From San Francisco or Seattle it is possible to steam direct across the North Pacific to Japan and China, or to go via Honolulu; via Honolulu too, there are services to New Zealand and Australian ports. Some of the steamers call at the Society, or the Samoan and Fiji, Islands on the way.

The volume of trade between the United Kingdom and South Africa, the Cape of Good Hope and Natal, shows during a period of nearly sixty years, a greater ratio of increase than that of any other part of the Empire with the Mother Country. In the year 1855 the value of imports and exports amounted to just under £1,800,000; this has increased to nearly £30,000,000. In round figures this gives a seventeenfold increase. Nor does this by any means exhaust our trade with the African Continent, for in addition to our *occupation* of Egypt, we have spheres of influence and possessions on both the East and West coasts, and large areas in the more central parts of the Continent, in connection with all of which there is a developing trade. The routes followed by British steamers in these trades will be found marked on the map at the end of the volume.

One of our most important steamship amalgamations despatches steamers every Saturday from Southampton with the South African mails. The route is by way of Madeira to Cape Town and Durban (Natal), calling at intermediate ports. Durban is the terminus for the South African mail steamers. On the return they call at East London, Port Elisabeth, Mossel Bay, and Cape Town, thence to Madeira and Southampton.

At the time of writing (January 1914) the steamers leaving Southampton on the Saturday arrive at Durban on the Sunday, three weeks and one day later. This service is on the point of being accelerated. The same Company despatches an *intermediate* steamer from London each week—these vessels proceed alternately via Las Palmas (Canary Islands) and Teneriffe—and once each month they call at Ascension and St Helena with mails, and continue the voyage as far as Mauritius, calling *en route* at Beira, a port on the East African coast belonging to Portugal. Thus a regular service is maintained, not only with the chief ports of South Africa, but with the Islands of Ascension, St Helena and Mauritius. In addition to these services down the West coast, the same line of steamers have regular monthly sailings from London down the East Coast, by way of the Mediterranean and Suez Canal, calling at Southampton, Gibraltar, Marseilles, Naples, Port Said, Port Sudan, Aden, Mombasa, Zanzibar, Port Amelia (Mozambique), Mozambique, Chindi, Beira, Lorenzo Marques (Delagoa Bay) and Durban, thus connecting with the South African mail service. The steamers on the East coast service call at the same ports on the homeward voyage. Steamers of this same line also call at regular intervals at Lobito Bay for Benguella (Portuguese West Africa).

Turning now to the routes linking up the United Kingdom with the Americas, the table of figures (appendix) shows that the volume of our trade with the United States of America has in point of value exceeded the volume of trade with any other single country at each of the periods taken.

Imports and exports to the value of nearly £44,000,000 in the year 1853 have satisfactorily increased to the sum of over £182,000,000. During the same period, too, the figures for our trade with Canada have risen from under £8,000,000 to over £50,000,000.

The North Atlantic trade is the biggest thing in modern shipping business, and gives employment to the largest and most luxuriously appointed steamships afloat.

The growing number of vessels crossing the Atlantic in both directions has led to the routes being standardised. The first suggestion in this direction was made by Lieutenant Maury, who pointed out the advisability of having definite lanes or tracks, providing a separate route for outward bound and homeward bound vessels. Along these lanes steamers can proceed with a maximum of safety, there being no vessels coming from the opposite direction along exactly the same track—while at the same time, in the event of a breakdown, or serious accident, the vessel will be in the direct route of following ships. The lanes across the Atlantic are not the shortest routes, but they have been adopted as being the shortest compatible with safety. In the North Atlantic, during certain months of the year, drifting icebergs are a great danger to shipping. During the winter, the ice, being a solid frozen mass, is retained in the North, but the summer heat loosens the hold of the frost, and great masses of ice float southwards. Some icebergs measure as much as 250 feet in height above the sea, and it has been calculated that the bulk of ice appearing above the water is only about one ninth of the entire mass. By means of keeping careful records of the southern limits to which icebergs usually float, it has been possible to lay down definite courses which shipping can safely follow at given seasons of the year. These Lane Routes have now been almost universally adopted.

TRACKS FOR ATLANTIC STEAMERS [1]

The following routes, agreed to by the Principal Steamship Companies, came into force January 15th, 1899 :—

Westbound.—From 15th January to 14th August,

[1] *Cf. Lloyd's Calendar*, 1913, pp. 370 and 371.

both days inclusive.—Steer from Fastnet, or Bishop Rock, on Great Circle course, but nothing South, to cross the meridian of 47° West in Latitude 42° North, thence by either rhumb line, or Great Circle (or even North of the Great Circle, if an easterly current is encountered), to a position South of Nantucket Light-vessel, thence to Fire Island Light-vessel, when bound for New York, or to Five Fathom Bank South Light-vessel, when bound for Philadelphia.

From 15th August to 14th January, both days inclusive.—Steer from Fastnet, or Bishop Rock, on Great Circle course, but nothing South, to cross the meridian of 49° West in Latitude 46° North, thence by *rhumb line*, to cross the meridian of 60° West in Latitude 43° North, thence also by *rhumb line*, to a position South of Nantucket Light-vessel, thence to Fire Island Light-vessel, when bound to New York, or Five Fathom Bank South Light-vessel, when bound for Philadelphia.

Eastbound.—At all seasons of the year steer a course from Ambrose Channel Light-vessel, or Five Fathom Bank South Light-vessel, to cross the meridian of 70° West, nothing to the northward of Latitude 40° 10′.

From 15th January to 23rd August, both days inclusive.—Steer from 40° 10′ North, and 70° West by *rhumb line*, to cross the meridian of 47° West in Latitude 41° North, and from this last position nothing North of the Great Circle to Fastnet, when bound to the Irish Channel, or nothing North of the Great Circle to Bishop Rock, when bound to the English Channel.

From 24th August to 14th January, both days inclusive.—Steer from Latitude 40° 10′ North, and Longitude 70° West, to cross the meridian of 60° West in Latitude 40° North, thence by *rhumb line* to cross the meridian of 45° West in Latitude 46° 30′ North, and from this last position nothing North of the Great Circle to Fastnet, when bound to the Irish Channel, and as near as possible to, but nothing North of the Great Circle to Bishop Rock, always keeping south of the Latitude of Bishop Rock, when bound to the English Channel.

CANADA

The following tracks, agreed to by the principal steamship lines, came into force on 10th April, 1911:—

Track "*A.*"—(From 15th February to 10th April, both days inclusive.)—*Westbound.*—Steer from the Fastnet, Innistrahull, or 10 miles South of the Bishop Rock on Great Circle course, to cross the meridian of 47° West in Latitude 42° North, thence to Halifax or other port, passing not less than 30 miles South of Sable Island. *Eastbound.*—Steer from Halifax to pass 20 miles South of Sable Island to Longitude 47° West, in Latitude 43° North, thence on the Great Circle course to the Fastnet, Innistrahull, or 10 miles South of the Bishop Rock.

Track "*B.*"—(From 11th April to 15th May, or until the Cape Race route clear of ice, and 15th

November to 14th February.)—*Westbound.*—Steer from the Fastnet, Innistrahull, or 10 miles South of the Bishop Rock on the Great Circle course to the meridian 50° West in 45° 55′ North, thence to Halifax or the gulf of St Lawrence. NOTE.—The Donaldson Line reserve the right to cross Longitude 45° West in Latitude 45° North on this track. *Eastbound.*—Steer from Halifax or the Gulf of St Lawrence to cross the meridian of 50° West in Latitude 45° 25′ North, thence on the Great Circle course to the Fastnet, Innistrahull, or 10 miles South of the Bishop Rock.

Track "*C.*"—(From 16th May to the opening of Belle Isle route.)—*Westbound.*—Steer from Fastnet, Innistrahull, or 10 miles South of the Bishop Rock, on a course 10 miles North of the Great Circle track until approaching Cape Race, and in thick weather steer a course to pass 20 miles South-east of Cape Race, thence to the St Lawrence. *Eastbound.*—Steer from Cape Race on a course 10 miles South of the Great Circle track until approaching Fastnet, Innistrahull, or 10 miles South of Bishop Rock. In thick weather steer a course to pass 30 miles South-east of Cape Race.

Track "*D.*"—(Belle Isle route—from the opening of the Straits of Belle Isle to 14th November.)—*Westbound.*—Steer from Fastnet, Innistrahull, or 10 miles South of the Bishop Rock, on a course 10 miles North of the Great Circle track until approaching Belle Isle. *Eastbound.*—Steer from Belle Isle on a course 10 miles South of the Great

Circle track until approaching Fastnet, Innistrahull, or 10 miles South of the Bishop Rock.

General Instructions

Commanders, on encountering ice, have permission to deviate from these tracks, and, after the end of October, to leave the Belle Isle for the more southerly route at their discretion, according to weather conditions.

Owing to the disaster which happened to the *Titanic* in the month of April 1912, routes were reconsidered by a Commission which sat at Brussels, and early in the year 1913 the following modifications of the previously arranged routes were agreed :—

Tracks for Atlantic Steamers.[1]

The following North Atlantic U.S. Lane routes, agreed to by the principal Steamship Companies, came into force 15th April, 1913, and superseded those which had been in force since 15th January 1899 :—

Westbound.—From 1st February to 31st August, both days inclusive.—Steer from Fastnet, or Bishop Rock, on Great Circle course, but nothing South, to cross the meridian of 47° West in Latitude 41° 30′ North, thence by either rhumb line, or Great Circle to Boston Light-vessel or to a position South of Nantucket Light-vessel.

[1] *Lloyd's Calendar*, 1914, pp. 372 and 373.

From 1st September to 31st January, both days inclusive.—Steer from Fastnet, or Bishop Rock, on Great Circle course, but nothing South, to cross the meridian of 50° West in Latitude 44° North, thence by either rhumb line of Great Circle to Boston Light-vessel, or to a position South of Nantucket Light-vessel.

Eastbound.—At all seasons of the year from the position of 70° West and 40° 10′ North, or from Boston.

From 1st February to 31st August, both days inclusive.—Steer by rhumb line to cross the meridian of 47° West in Latitude 40° 30′ North, and from this last position nothing North of the Great Circle to Fastnet or Bishop Rock.

From 1st September to 31st January, both days inclusive.—Steer by rhumb line to cross the meridian of 50° West in Latitude 43° North, and from this last position nothing North of the Great Circle to Fastnet or Bishop Rock.

The date on which tracks change is to apply to the meridian of Fastnet for Westbound steamers, and that of 70° West for Eastbound vessels. The Northern track for the steamships of the Cie. Generale Transatlantique commences 15th October.

NOTE.—Special tracks (Westbound and Eastbound) are agreed by telegraphic communication between the Lines concerned when varying circumstances, owing to abnormal conditions, make such special tracks advisable.

As an additional precaution the British Government have placed the *Scotia*, and the United States Government the *Seneca* and the *Miami*, on the North Atlantic to render service as ice scouts. The expense of maintaining the *Scotia* is to be borne partly by the Government and partly by the large steamship companies. These vessels are fitted with wireless telegraphy and give warning both to shipping and to stations on land of any abnormal iceberg, or any ice conditions likely to be a danger to shipping.

Further to the south come the routes to the ports on the Gulf of Mexico, the West Indian Islands, and the east coast ports of the States of Central America. The volume of trade with our West Indian Islands and British Guiana reached its highest value during the 'seventies, about £10,500,000; since then it has fluctuated, and it decreased, until the year 1897, when it only reached the sum of £4,700,000. The West Indies have, however, recovered somewhat, and the latest returns give a total of over £6,000,000, nor is the improvement likely to stop at this point, as there is an energetic policy of trade development now in progress. The increased demands for fruit, cotton, sugar and mineral oils, and the possible effects of the opening of the Panama Canal, should open a new era of prosperity for this part of the Empire.

There are many possible ways of getting to the West Indies and Central America. The main routes for steamers from the United Kingdom are either from Southampton to Cherbourg (from April to September touching at St Michaels in the Azores), thence to the islands of Barbadoes and Trinidad, then on to the mainland touching at Puerto, Colombia, Cartagena and Colon, then to Jamaica (Kingston) and Cuba (Antilla), and on to New York; or there are steamers going direct from Bristol and Liverpool to Jamaica, Colon and Costa Rica; and there is a local service of steamers linking up all the main islands with the principal ports on the mainland.

With the States on both the Atlantic and Pacific sides of South America the trade of the United Kingdom has most satisfactorily increased, more especially of recent years. The remarkable developments in the meat trade with Argentina during the past few years is demonstrated by the figures in the table (*cf.* appendix 5). Our volume of trade with the east coast States in the year 1855 was only about £8,250,000, by the end of the century it had quadrupled, but between 1900 and 1910 it increased to the value of nearly £88,000,000. Turning to the figures for the States on the Pacific side, the growth has not been so remarkable, but it has been steady and satisfactory. In the year 1855 it was just a little less than the trade with the Atlantic States, by the end of the century it had increased by only £2,600,000, but during the first decade of the century there was an increase of nearly £7,000,000. The trade with the Americas is the more interesting at the present moment because the opening of the

Panama Canal is expected to produce some important modifications. After tracing out some of the main routes and connections, one must carefully consider the question of the Panama Canal, and its possible effects on the trade both of the Americas, and generally on the trade centres and trade routes of the world as a whole. These problems will only be finally resolved when the Canal has been fully working for some years. Previous experience, however, notably what occurred in consequence of the construction of the Suez Canal, may serve to some extent as a guide, and it is doubtless on this kind of experience that the trading interests concerned are preparing to act at the present juncture. Many of the expectations in connection with the Suez Canal were falsified, in some cases indeed the effects of the new route were almost directly the contrary of what was expected. A wide knowledge of economic laws, which is really but another name for sound business experience, will be now, as always, the surest guide. The nation and the trader who, during the uncertainties of new conditions, act in accordance with these, will be the nation and the individual to benefit by the new possibilities. No nation, however advantageously situated, can flout natural laws, and reap the full benefit from its advantages—this is indeed one of the great lessons of commercial history.

The west coast trade is the last resort, on a large scale, of the sailing ship which can still pay a dividend by carrying a cargo of coal outwards, and bringing back corn or nitrate. In this trade the French and the Germans have been more successful than the British. Their arrangements have been methodical and business-like in the most modern sense of those terms. The west coast is one of the worst places in the world for a ship to become foul. The growth of grass and barnacles on submerged structures, and in this connection on the bottoms of iron and steel ships, is such that, after lying a few weeks in a west coast port, a ship becomes so foul that speed is very considerably decreased. Only those who have actually seen and experienced the extent to which these growths on a ship's bottom can affect the speed, know how disastrous it is for a ship to remain long on the coast. And yet British owners have sent their ships there year after year without making proper arrangements for immediate discharge and quick despatch. Nowhere does the British ship-owner come so far behind his competitors as in this trade. The French and the Germans have first of all built a special type of ship suited to the conditions of the trade, then the trade has been organised so that on arrival the ship is immediately and quickly discharged, the homeward cargo is in readiness, the ship is quickly reloaded, and after but a short time, during which submarine growths have had but little chance of doing anything effective, the ship is ready for sea.

There is yet another lesson that our competitors teach us, for a sailing ship on leaving a west coast port may waste many days in the attempt to get into the south-east trade wind. The French and German owners have a system for remedying this state of affairs, and for making sure that a ship shall have every chance of making a decent passage home. Not only is she got ready for sea without any unnecessary delay; but when ready, instead of being a possible victim to unfavourable sailing conditions, a powerful tug is on the spot and tows the ship two or three hundred miles to meet the wind. This is business, and it deserves to command success. (On the map of routes at the end of the volume a number of sailing ship routes have been traced to and from the west coast. It is unnecessary to enlarge on these.) The steamer routes from the United Kingdom to South America are fairly simple. Leaving London, Southampton, or Liverpool, and calling at some French or Peninsular ports, they make for Madeira and St Vincent (Cape Verde Islands), going thence direct to Pernambuco. Other steamers leaving United Kingdom ports call at several ports on the Continent, including Gibraltar, then crossing to Tangier, and some ports on the north-west coast of Africa, they make for the Canary Islands, Cape Verde Islands, and then to Pernambuco. There the mail service continues right round the coast, the steamers touching at Bahia, Rio de Janeiro, Santos, Monte Video, Port Stanley (Falkland Island), Punta Arenas (Straits of Magellan), Coronel (S. Chile), Talcahuano, Valparaiso, Coquimbo, Antofagasta, Iquique, Arica, Mollendo (S. Peru), and Callao. There are also coastal services which complete the communication with all the coast towns. The original organisation and the continued progress of those services were, and remained for many years, entirely in British hands; of recent years, however, competitors, notably the Germans, have entered the field. The German service to Buenos Ayres (1913) is rather faster than the British mail service, this is partly due to the British steamers calling at so many ports *en route*. A modified British service is about to be commenced, this will reduce the voyage from about 21 days to about 18 days. But the possibilities of development in South America are so enormous that there should be ample room for all comers for some years to come.

CHAPTER VIII

THE PANAMA CANAL

THE value of a waterway between the Atlantic and Pacific Oceans through Central America has been realised by statesmen and traders ever since it was known that only a narrow isthmus connected the continents of North and South America. Early explorers gave their attention to finding a natural waterway, there being a tradition that there was a navigable passage. This rumour was at length exploded, and from that instant the feasibility of cutting a canal has been under consideration. It was agreed nearly four hundred years ago that a canal might be constructed if a sufficient labour force to cope with the work were available. The Spanish, the Dutch, the French, the Americans and the British have all had schemes. The French, listening to the successful constructor of the Suez Canal, sank many a hard earned million in the Isthmus. It makes a sordid story, which happily need not be repeated here; indeed it should be allowed to fall into oblivion, whilst remembering that the French were the first to attempt to grapple with a very difficult problem, and that not only did they select the best route for the line of the canal, but in spite of failure to bring their work to a successful issue, they did appreciably contribute to the sum total of the work. The United States Government was able to utilise some of the tools and plant left by the de Lesseps' Company, and paid, for them and the work actually accomplished, 40,000,000 francs.

In the success which the world hopes to celebrate in the year 1915, the Doctor has been as important a factor as the Engineer. The region where the canal has been constructed was one of the deadly plague spots of the world. Malaria and yellow fever proved terribly formidable opponents. The spur of the Andes which had to be severed could be dealt with, provided that the ravages of disease could be restricted. The death rate among workers on the Isthmus was appalling. In the face of what the French suffered, it may well be doubted whether success would ever have been attained, but for the discovery that the high rate of human mortality could be reduced almost to zero by taking measures to annihilate two species of mosquito infesting the district. The researches of Sir Ronald Ross had proved that malaria is carried by a mosquito (anopheles) from infected persons, and this mosquito affects healthy people with its poisoned bite. This discovery enabled Sir Ronald to stamp out malaria at Ismailia and Port Said.

When the Americans were fighting in Cuba, yellow fever was found to be more deadly than the Spaniard. Thus the medical corps, knowing what had been effected by Sir Ronald Ross, experimented with mosquitoes to find out if the fever could be transmitted in the same way. The culprit was found to be another species of mosquito (Stegomyia). It was thus proved that the two terrible diseases of the Panama district, malaria and yellow fever, were spread by two species of mosquito. Yellow fever was the disease of the town; malaria, of the open country. It was discovered that the malaria mosquito bred in the stagnant pools and marshes in the low-lying parts of the Isthmus. The stegomyia breeds in tanks and other receptacles which were utilised for town water supply. Here then was the cause and effect of both diseases clearly explained, but a successful policy for exterminating the insects had yet to be formulated. The credit for accomplishing this great work, and making Panama habitable, is due to Mr Charles E. Magoon and Colonel William C. Gorgas. Under their superintendence a thorough cleansing of all dwellings, buildings and streets in the town was rigorously carried through, the water supply was entirely modernised, and a drainage system on approved lines installed. This in the town; in the open country a clearance of considerable width was made on both sides of the canal works, and every pool within a given area, where the anopheles might breed, was sprinkled with paraffin. The result of this work is that since September 1905 yellow fever has been almost unknown in the canal zone, and malaria, a more troublesome disease to restrict, has been already reduced to one-third of what it was, and will eventually, it is hoped, be stamped out altogether.

The policy of the French company had been to erect thoroughly well-equipped hospitals, and make every effort to cure those who might be struck down by these fell diseases. The Americans adopted a different method; prevention was first aimed at, whilst cure was only attempted where prevention failed. Happily, owing to medical research, it has been found possible to adopt successful preventive measures, and a new era has been opened in the development of what have hitherto been unhealthy tropical regions.

This discovery was made just in the nick of time for the construction of the Panama Canal. When the United States had once undertaken to carry through this great work, the general expectation was that it would be hustled through in American fashion. In fact the Government at Washington urged expedition with the work, and at first belittled the efforts made at reducing the deadliness of disease, though fortunately continuing to send the necessary supplies required by the medical staff. The men on the spot thoroughly understood the greatness as well as the difficulties and dangers of the task to which they had set their hands, and nearly three years were devoted first of all to getting a thorough understanding of the work and all that it entailed, and secondly, in the equally important work of rendering the zone a healthy place wherein to work and live. Having practically overcome the danger from disease it was but a matter of patience and perseverance to complete the great cutting through the Isthmus. American ingenuity devised quick working tools capable of dealing with extraordinary quantities of earth or rock in a comparatively short time. The amount of excavation to be accomplished would, it is calculated, fill a train of railway trucks about 96,000 miles long. The French had decided to construct a sea-level canal, and this was at first the decision of the Americans, and indeed may eventually be done, but to commence with they have wisely modified their original scheme, and are constructing a lock canal, though in doing so they have abandoned the policy owing to which Panama had been preferred to Nicaragua. As to the canal itself, out of an entire length of 50 miles from deep water in the Atlantic to deep water in the Pacific, there is a stretch of about 8 miles on the level at both the Atlantic and Pacific ends, and between the Gatun Locks and the Pedro Miguel Lock there is a stretch of some 30 miles of canal, which is 85 to 87 feet above the sea level. The official description of the canal is as follows :—

"The Panama Canal[1] does not, as is quite generally thought, cross the Isthmus from East to West . . . its general direction is from North West to South East, the Pacific entrance near Panama being about 22½ miles west of the Atlantic entrance near Colon. It is a lake canal as well as a lock canal, its dominating feature being Gatun

[1] *The Official Handbook of the Panama Canal*, 3rd edition, p. 5.

How in hell could that be?

Lake, a great body of water covering about 164 square miles, and occupying the northern half of that portion of the Isthmus through which the canal passes. This lake is an elevated body of water with a surface level maintained at from 85 to 87 feet above sea level by the Gatun Dam and locks on the Atlantic side, and the Pedro Miguel Locks and dam on the Pacific side. The Culebra Cut is really an arm of the lake. On both the Atlantic and Pacific sides there is an approach channel, which is an inlet of the sea, extending from deep water in the sea up to the foot of the locks, which lift vessels to the level of the lake through which they are to pass.

"The entire length of the canal from deep water in the Atlantic to deep water in the Pacific is about 50 miles. Its length from shore line to shore line is about 40 miles. In passing through it from the Atlantic to the Pacific, a vessel will enter the approach channel in Limon Bay, which has a bottom width of 500 feet, and extends to Gatun, a distance of about 7 miles. At Gatun it will enter a series of three locks in flight and be lifted 85 feet to the level of Gatun Lake. It may steam at full speed through this lake, in a channel varying from 1000 to 500 feet in width, for a distance of about 24 miles to Bas Obispo, where it will enter the Culebra Cut. It will pass through the Cut, a distance of about 9 miles, in a channel with a bottom width of 300 feet to Pedro Miguel. There it will enter a lock and be lowered 30⅓ feet to a small lake, at an elevation of 54⅔ feet above sea level, and will pass through this for about 1½ miles to Miraflores. There it will enter two locks in series, and be lowered to sea level, passing out into the Pacific through a channel about 8½ miles in length with a bottom width of 500 feet. The depth of the approach channel on the Atlantic side, where the maximum tidal oscillation is 2½ feet, will be 41 feet at mean tide, and on the Pacific side, where the maximum oscillation is 21 feet, the depth will be 45 feet at mean tide. The mean sea level in both oceans is the same.

"Throughout the first 15 miles from Gatun, the width of the Lake Channel will be 1000 feet; then for 4 miles it will be 800 feet, and for 4 miles more, to the northern entrance of Culebra Cut at Bas Obispo, it will be 500 feet. The depth will vary from 85 to 45 feet. The water level in the Cut will be that of the Lake, the depth 45 feet.

"Three hundred feet is the minimum bottom width of the Canal. This width begins about half a mile above Pedro Miguel Locks and extends about eight miles through Culebra Cut, with the exception that at all angles the channel is widened sufficiently to allow a thousand-foot vessel to make the turn. The Cut has eight angles, or about one to every mile. The three hundred foot widths are only on tangents between the turning basins at the angles. The smallest of these angles is 7° 36′, and the largest 30°.

"In the whole canal there are twenty-two angles, the total curvature being 600° 51′. Of this curvature

281° 10′ are measured to the right going South, and 319° 41′ to the left. The sharpest curve occurs at Tabernilla, and is 67° 10′."

The canal is to be opened, it is hoped, to the ships of all nations on the 1st January 1915. It was hoped that the first boat to cross the isthmus by water would do so on the 25th September 1913, the four hundredth anniversary of the day when Balboa, the first European to view the Pacific, climbed the heights and gazed over the newly discovered ocean. But owing to unforeseen delays in the work of excavation this was not accomplished

CHAPTER IX

SOME OF THE ECONOMIC EFFECTS OF THE OPENING OF THE PANAMA CANAL

There have already been many pronouncements as to what the canal will effect, and there will be many more before the opening ceremony takes place. The United States Government, during the work of construction, has had experts at work considering every possibility, so as to have the best information available for the purpose of fixing tolls and the conditions and regulations under which the waterway may be used.

In endeavouring to estimate what the economic effect of the opening of the canal will be, it must be remembered that from the broad business point of view there are two spheres in which it is likely to have considerable, though different, effects. First of all there is the local sphere. The canal will add enormously to the facilities for transport and communication between the States, which together make up North and South America; and may be expected to lead to important developments on the American continent, which could scarcely be looked for unless this new artery of communication be opened. There is secondly the effect the canal may have on what may be more generally described as world trade. These spheres, though in the main separate, do at one point overlap somewhat, because the very developments that may be expected to result locally from the opening of the canal will have considerable effects on world trade. But it will repay to make a distinction of this kind, even though it be somewhat unsatisfactory, as it will help to bring into prominence a very important fact connected with commerce already referred to, but too frequently forgotten, that one country may increase its volume of trade and develop its commercial interests by the opening up of new markets, and by the natural progress of trade, without necessarily doing so at the expense of other commercial and industrial nations.

Old trades may be enjoying but a natural increase, while some new opportunities may arise which may increase the volume of trade to the benefit of but one country. This has occurred frequently in our own history. It is likely to occur again both in connection with the Panama Canal, and with the awakening of China. Years must pass before the economic historian will be able to definitely tabulate results, or the world at large fully realise who has gained the greatest commercial benefit from either one or both these great events. In years to come, too, it will be necessary for the historian to avoid the error of attributing all the great trade developments of the early years of the twentieth century to the piercing of the Isthmus of Panama.

Japan made her appearance in the front rank, and had thrown off the backwardness of Easternism while the doctors were killing the mosquitoes on the Isthmus and preparing the way for the engineer. China, too, is awakening, and that event is likely to have world-wide effects. This would have come even though Panama had proved unpierceable. The modernising of the Far East will have a much more considerable effect, both politically and commercially, than the construction of the Panama Canal.

Turning in the first instance to the economic effects of the opening of the Canal on world trade, it has been realised, though perhaps not so clearly as it should have been, that there will be other factors affecting the situation in addition to the saving of distance. But until the new route is fully available for commerce it will hardly be possible to realise every consideration that will weigh with importers and shippers.

Some light, however, may be thrown upon the subject by a consideration of a few of the factors which have been and will continue to be taken into account, either directly or indirectly, in deciding (*a*) who shall supply certain markets with either manufactured goods, raw materials or food stuffs, and (*b*) what routes shall be taken by the shipping which performs the necessary work of transport. No route can possibly furnish the whole of these factors, and as here, as in other spheres, the less important has to give way to the more important, the final decision will depend on the balance of advantages. The principal of these factors, arranged rather in their natural order than in order of importance, are—

1. Distance.
2. Tolls.
3. Freights and the possibility of continuous freight earning.
4. Fuel Stations—coal or oil.
5. Insurance Rates.
6. The Political Factor.
7. Rates of Exchange.
8. Finance, Banking and Investment.
9. The Human Factor (manufacturing and commercial ability, experience of trade and markets, present possession).

1. *Distance*

The lessening of an ocean voyage by a few hundred miles may have a very direct effect in decreasing the cost of transporting goods, and so should favourably affect freights in the interest of the importer. A modern steamer represents a large amount of capital; there is connected with the working of such a ship considerable expense each day for wages, food, fuel and running expenses generally; and then in addition to this there is interest on the capital, depreciation, and other items inseparably connected with the business of ship-owning. Thus mileage run in the case of cargo transported by sea is a serious factor with which ship-owners have to reckon. In this, shipping offers a great contrast to railways. When railway trucks are once loaded, length of haul has comparatively little effect on the cost of the service. Thus, superficially, one would expect that a route, saving about 2500 miles, as will be the case via Panama on the voyage between England and New Zealand, and New York and New Zealand, would very considerably benefit the Eastern manufacturing States of America at the expense of British manufacturers, and have a very marked effect in assisting the progress of the American mercantile marine at the expense of the British ship-owner. Even though the ships of both countries pay the same rate of toll, the saving of distance promises to give a great advantage to both the American ship-owner and the American manufacturer.

The keenest competitors for the supply of manufactured goods in the world's markets at the present moment are the United Kingdom, the United States of America, and Germany. All three of these must be affected to some extent by the opening of the Panama Canal. So far as the mere saving of distance is concerned the United Kingdom and Germany will suffer or benefit together, for the short distances between the exporting ports of North-western Europe are practically negligible in the long sea voyage to the Far East, or even to South American ports. Thus when making a comparison between London and New York, from this point of view, one is really considering the advantages or disadvantages accruing to the manufacturers of Western

Europe as compared with those of the Eastern States of America.

In trying to estimate the possible effects of the opening of the Panama Canal from this point of view, the chief foreign markets of the world demanding imported manufactured goods may be divided roughly into three classes :—

(1) In the first class come all those countries which are in close, or fairly close, proximity to the Canal. These include all the states of North and South America, and the adjacent islands. So far as some of these are concerned the transport services should pass through the Canal. From Valparaiso northward, all trade to or from the Eastern States of America and Europe, and from Pernambuco northward, all trade to and from ports on the Pacific coast of North America should almost of necessity pass through the Canal. The effect of the Canal on this trade, so far as distance is concerned, will be very considerable. From London to San Francisco round Cape Horn is only about three hundred miles further than from New York to San Francisco. The Canal will effect both voyages, but while it shortens the distance from London by five thousand five hundred miles it brings New York nearer to San Francisco by eight thousand miles; an advantage of over two thousand miles, which, with the possibility of freedom from tolls for coasting vessels belonging to the United States, will give the manufacturers of the Eastern States a very great advantage in any open markets. The Western

States of America will also benefit in another way. It is practically certain that the opening of the Canal will give a great impetus to the immigration of Europeans. Thus a rapid development of States which have hitherto been comparatively unprogressive may be looked for.

(2) In the second class come Australasia and the Far East. At present the shipping supplying these markets has a choice of routes. For some ports there is the choice of three routes, via the Suez Canal, via the Cape of Good Hope, and via Cape Horn, for others only two of these. From the moment that the Isthmus of Panama is pierced there will be another alternative. This second class shades off gradually into the third class, (3) which comprises ports which will not be directly affected by the new route. It is mainly to the ports comprised in the second class that attention is being directed when an attempt is made to estimate the importance of the Panama Canal to world trade. It will be noticed by referring to the map of trade routes and the table of distances[1] that there is a meridian which so far as actual steaming or sailing distance is concerned is about equidistant from London via the Suez Canal, and from New York via the Panama Canal. The point of this meridian on the South coast of Australia is represented very nearly by Port Lincoln, South Australia; Adelaide being the nearest of the great ports of Australia. Most of the Asiatic trading ports will continue to be nearer

[1] *Cf.* Appendix No. 18.

to London than to New York, for though by going via Panama instead of via Suez the distance between New York and Shanghai is reduced from 12,321 to 11,240 nautical miles, London via Suez is nearer by 799 miles, the distance being 10,441 miles. All ports west of Shanghai will remain nearer to London via the Suez Canal than from New York via Panama. For instance, the voyage to Manila will be 2000 miles less from London via Suez than from New York via Panama. Indeed, and this makes the point perhaps clearer, it will save something like 200 miles when steaming from New York to Manila to go via Suez rather than by the new route. On the other hand, all Japanese and New Zealand ports and Australian ports east of Port Lincoln will be nearer to New York via Panama than to London by any route. For instance, Yokohama will be 892 miles nearer New York than London, Melbourne 831 miles, Sydney 1612 miles, Brisbane 2933 miles, Auckland 3660 miles, Wellington 3717 miles, and Dunedin 3137 miles. Thus, with the opening of the Panama Canal, the chief Australasian ports from Melbourne eastwards, which have hitherto been, roughly speaking, from 900 to 1800 miles nearer to London than to New York, will be nearer to New York by several hundred miles. If it be correct to reckon the normal cost of transporting a ton of goods 1000 miles at about two shillings, then, even though the Suez and Panama tolls be of equal amount, this saving of distance will give the manufacturers of the Eastern States of America an advantage of from two shillings to seven shillings and sixpence a ton on any goods they may export to Australian and New Zealand ports between Melbourne and Wellington. Here then is the case so far as mere distance to be traversed is concerned; on the face of it one might conclude that the advantage given to American manufacturers would be such that in certain markets Europe would no longer be able to efficiently compete. At this point, however, other factors emerge, and in considering them it becomes apparent that distance saved is but one of several considerations which weigh with both the importer and the exporter.

2. *Tolls*

When the Suez Canal was opened to traffic, the great saving of distance between Europe and the Far East operated at once. The only alternative route entailed steaming a distance of 4000 miles further than that via the Canal, and this was sufficient to give the Canal a practical monopoly. So far as tolls are concerned, a diminution in the rate charged, whilst giving satisfaction to the users of the Canal, cannot appreciably increase the tonnage passing through, and on the other hand, an increase in the charges might cause grumbling, but, up to a certain point, would not decrease business. With the Panama Canal the circumstances are somewhat different; there are alternative routes which much of the traffic likely to pass through the Canal might take. Thus the fixing of regulations and tolls is a very serious business. There has been a great amount of discussion on this subject from the political, as well as from the commercial, point of view. Does the United States Government wish the Canal to be a paying concern like the Suez Company; will it be content if running expenses are covered, together with a small surplus in addition with which to form a sinking fund to gradually pay off the original cost of construction; or will the tolls be but nominal, the American Government shouldering the burden almost entirely? The question was by no means set at rest by the publication in November 1912 of the conditions on which the Canal may be used and the tolls to be charged. That proclamation according to some authorities contravenes treaties made both with Great Britain and the State of Panama. International lawyers and diplomacy must decide as to this. To the plain man the situation is that the United States have constructed the Canal, and think it a good opportunity to administer a check to the monopolistic policy of their own trans-continental railways, and at the same time give an advantage to American owned tonnage, which might give just the amount of impetus necessary to enable it to regain the position it enjoyed seventy years ago.

The main object for the construction of the Canal was probably political. The United States wishes to be supreme on the Pacific Ocean. President Taft has said that when the Canal is open to traffic the Pacific will become an American Lake. Undoubtedly the facility for steaming rapidly from the Atlantic to the Pacific, without causing serious delay at a time of danger, such as was experienced by the *Oregon* during the Spanish-American war, will add greatly to the efficiency of the United States fleet. But that it will double its efficiency, as one authority thinks, or that the four hundred million dollars spent on the Canal will be equivalent to a similar sum expended on the navy, as others think, is a debatable proposition. With guns capable of firing projectiles twenty miles, a Dreadnought, invisible from the fortified islands at the entrance of the Canal, might, by a lucky hit, destroy locks or dams, or at any rate might constitute such a danger that the value of the United States fleet would be very considerably discounted. The thought suggests itself that probably in time of war, as in time of peace, it would have been wiser to have safeguarded the Canal by an international guarantee of neutrality rather than by fortifications under the control of one State, however powerful. A well-equipped fleet near the entrance in time of war would have been a more effectual check to hostile fleets than fortified islands, whose positions can easily be located under modern conditions, and whose ability to offer an effective resistance is considerably restricted. That, however, is the business of the American Government. They have persuaded Great Britain to waive objections to fortification, and the policy of armed control, by the United States alone, has been definitely decided upon. What the annual cost of this will be only time can show, but it may be safely asserted that the United States have embarked upon an expensive forward policy, of which the annual expense will by no means be a mere bagatelle.

The main points about the schedule of tolls issued in November 1912 are that merchant ships carrying either passengers or cargo will pay a toll of $1·20 cents per net ton. Ships in ballast, without passengers or cargo, will pay 72 cents per ton. Men of war will pay 50 cents on each ton of displacement, and naval and army transports will be on the same footing as merchant ships.

So far good, but unfortunately there is another proviso, namely, that ships belonging to the United States register and employed in the coasting trade, except those belonging to Railway Companies, shall pass toll free.

Against this provision a serious protest has been raised by Great Britain, supported by Germany, whose interests in that part of the world are great and growing. Should the United States Government maintain freedom of tolls for American ships engaged in the coasting trade, a number of problems will arise. The press has already discussed this matter very fully, and some of the principal points at issue may be set down. Great Britain contends that under the treaty it was agreed by the United States that the Canal should be open to the commerce of the world on equal terms. Apparently the Americans do not altogether dispute this, but it is urged on their side that when the Hay-Pauncefote treaty was negotiated, the proposal was to construct a canal through foreign territory, namely, through the State of Columbia. But since then the revolt of Panama has created a new situation for that State made over to the United States Government, practically in full sovereignty, a strip of country ten miles wide right across the Isthmus. The construction of a ship canal through their own territory, is, it is contended, a very different thing from constructing one through a foreign State. This may raise one of those nice points of international law which rejoice the heart of a lawyer, but Monsieur Bunau-Varilla, who negotiated the treaty between the United States and Panama, points out that it was specially stipulated in that treaty that the clauses of the Hay-Pauncefote treaty, guaranteeing equality of tolls to the ships of all nations, should be incorporated in the treaty between the United States and Panama, and that these clauses still stand.

The United States Government may not have been aiming altogether at giving an undue advantage to the American coasting trade in drawing up the scheme of tolls. Indeed it is undoubtedly true that one great consideration weighing with the authorities was the possibility through the Canal of striking a blow against the monopoly selfishly exercised by the trans-continental railways. For ships belonging to these companies are stringently excluded from this benefit. One object of this is to create healthy competition between sea and land transport agencies, and obtain for the community the benefit of a state of competition rather than allow the present unsatisfactory system of monopoly to continue. Perhaps this might have been accomplished without raising international complications; possibly the difficulty may yet be arranged, by the United States discriminating in favour of their coasting vessels, or against vessels owned by the trans-continental railway companies, thus making the dispute domestic instead of international. But if the immunity of tolls for American coasting ships be maintained, in spite of protests or of arbitration on the subject, several interesting points will emerge. Doubtless a full and frank definition of a coasting voyage will be framed by the Government. It would certainly be interesting to see such a definition. A voyage between any ports belonging to the United States is counted a coasting voyage, even the voyage from New York to Manila is euphemistically so called. It has been hinted that the whole coast-line of both North and South America might possibly be included, so that any American ships trading between the ports of the United States and Canada or any South American States, would be entitled to traverse the Canal toll free. This would be stretching matters too far, and there is hardly a possibility that it would be seriously considered. But even as the term coasting voyage is at present understood, either the coasting ships themselves will find their operations restricted in a very galling manner, or it may be the strict letter of the regulations will be disregarded. For instance, as at present understood, an American coasting vessel would be barred from touching at the West Indian Islands, or at any foreign port on the coast; for by so doing she would render herself liable to the exaction of the toll.

There would be many difficulties in enforcing full and literal compliance with the regulations. Take, for example, a ship sailing from New York to San Francisco via the Canal. It would require an immense amount of supervision to prevent such a ship proceeding either northwards to Canadian ports, or southwards to ports on the coast of South America, and this difficulty would be intensified in the case of ships trading with the Philippines. The United States enjoys a growing commerce with the Far East. The saving of rather more than a dollar per net ton would give a distinct advantage to American traders. How would it be possible to prevent ships and goods, ostensibly going to Manila, from going still further east when once clear of American waters? It would clearly not be to the advantage of the American Government to exercise supervision in this matter, and experience shows the hopelessness of getting justice in such a case through diplomatic channels.

There is also another consideration which may be serious indeed to foreign shipping. The nominal toll has been fixed at $1·20 per net ton. It has been estimated that altogether ten and a half million tons of shipping will pass through the Canal during the first twelve months. Accepting this figure for the moment, the total amount produced by the tolls, if all ships contributed, would be something less than eleven million dollars. It is estimated that the cost of upkeep and the running expenses will be about two million dollars a year. An allowance of three per cent. on the cost of construction, viz. $400,000,000, will be twelve million dollars. These taken together amount to a sum of fourteen million dollars per annum. Thus at the outset, even though all ships passing through the Canal, without distinction, pay tolls, there will be an annual loss on this calculation of at least three million dollars. But if American coasting vessels pass through toll free, this loss will be still greater. How long will the Americans be content to subsidise shipping to this extent ? And be it remembered these are the commercial figures only, nothing has been allowed for the amount which must be spent on defensive works and their maintenance. Is the American Government prepared to adopt a policy which will place it in the position of public benefactor, in the first instance to their own coasting vessels, and then to a lesser extent to the shipping of all nations ? It does not seem a likely proposition. The most that can be expected is that the Canal be self-supporting, that is, the tolls received must pay working expenses, upkeep and maintenance, together with interest on the capital expended. If the sum of fourteen million dollars be accepted as covering these, and then one allows that of the tonnage passing through one-third will be able to claim exemption of tolls under the coasting vessels clause, then the tonnage on which tolls may be levied would be reduced from ten and a half million to seven million, and it would require not a toll of $1.20 per net ton, but a toll of $2 to produce the required amount. This will be a heavier toll than that charged by the Suez Canal Company, which has been reduced to 6 francs 25 centimes ($1·20) per net ton. Moreover, there are two important considerations connected with the question of tolls at Panama that must be taken into account. Every addition made to the tolls will decrease the amount of tonnage making use of the Canal. Here Panama differs from Suez, as has already been pointed out. Thus the ten and a half million tons calculated on the basis of a toll of $1·20 would shrink considerably were a toll of anything like $2 imposed. The other point is this; the foreigner may not consent to be a dumb beast of burden in this matter. Already Japanese shipping interests have outlined an ingenious policy by means of which the Canal might be rendered almost entirely unremunerative. It has been threatened that in the event of American coasting ships being allowed to pass through the Canal free, Japanese ships bound from the Far East to European or Eastern American ports will tranship their cargo at a Pacific port whence it may be carried through the Canal free by an American ship, and transhipped again at an Atlantic port, being carried to its final destination in a Japanese ship. It has been calculated that this transhipment would cost something like $2·50 per ton, which on the face of it would be a loss to the Japanese, but if all foreign shipping adopted this suggestion, how long would the American Government maintain the exemption from tolls of the coasting vessels?

Trade and commerce frequently take an unexpected course. It may be that before the Canal is finally opened to traffic the Government will see the wisdom of simplifying the toll system, charging the ships of all nations, including American ships, on one basis. This will settle the international question, and will very considerably free the hands of the Government. Then as to the machinery by means of which coasting ships may be benefitted as against those of the trans-continental railways, or even American shipping against that of any other nation using the Canal, this could be more easily arranged by a system of bounties—a system already adequately understood on the other side of the Atlantic.

3. *Freights and the possibility of continuous freight earning*

For the Panama route to give an advantage to American manufacturers in the shape of low freights, and to American shipping in the form of full cargoes and continuous demand for services (and these two really go hand in hand), there must not only be a large amount of freight from America to Australasia and the Far East, but there must be an equally large amount of return freight, and the possibility of picking up freight along the route. At present the demands of Australasia for manufactured goods are mainly supplied by Europe. The ships transporting these goods go either by way of the Cape of Good Hope, or through the Suez Canal. By the latter route a steamer passes, and may touch at, a number of trading ports. Mails, passengers, or cargo can be picked up, or landed by the regular liners. This does not, to so great an extent, affect cargo steamers, at any rate so far as intermediate freight is concerned; but the regular trading requirements have resulted in providing ample, and on the whole, economical, coaling and other facilities all along this route. Under different conditions the same is true of the Cape route. South Africa demands more in bulk than it gives in exchange. Gold and diamonds are not exported in ship loads, nor do ostrich feathers help to ballast a large steamer. Thus the regular liners return to England "flying light" as sailors say. But the route from England via the Cape is exceptionally well supplied with coaling facilities, and it is this, together with the invention of marine engines having a comparatively small coal consumption, which enables so many steamers in the Australasian trade to utilise the Cape route both out and home, instead of going through the Suez Canal, unless this be contrary to the charter party.

Until about the year 1900 steamers from Australia, unless chartered to return via the Suez Canal, almost invariably took the Horn route, this being considered a better way home than round the Cape of Good Hope; one reason being that the prevailing westerly winds down in southern latitudes are an assistance even to a steamer. This, by the way, may have some effect on the use of the Panama Canal by steamers bound to Europe from Australasia. No steamer would attempt to shape her course in a direct line from say Wellington to Panama. The south-east trade winds would be well ahead, and so have quite a considerable effect on her speed, and to make a détour to the south to avoid this would add quite considerably to the distance to be run.

Since the Boer War, the homeward route for cargo steamers from Australia has been modified. In many instances, steamers, unless debarred from doing so, return via the Cape of Good Hope. The war gave a great impetus to the development of the African coal fields, and a good quality of coal at a fairly low price is now available. This cheap South African coal offers an advantage to a fully loaded steamer. A steamer having cargo space would probably return, if allowed, via Cape Horn, touching at South American east coast ports. Even when the Panama Canal is available, homeward bound steamers from Australia having cargo space will probably continue to use the Horn route; for, though the imported coal at coaling stations on that route is dearer than that produced in the South African mines, a steamer with cargo space would almost certainly be able to complete her freight either with cargo or cattle, owing to the immense amount of trade between the ports on the eastern side of South America and Europe. (This trade, too, it should be remembered, has been developed almost entirely by British energy and capital, but of this later.)

It has been suggested that when the Panama route is available, all-round-the-world services will be organised by the leading shipping companies. This may be the explanation of the attempt made a few months ago by a well-known shipping combination, to absorb one of the oldest British companies trading in the Far East. Had this attempt succeeded, it would have been possible (and as there is nothing to prevent the attempt being repeated, it may yet be carried through) to inaugurate in the early days of 1915 a service of steamers from the United Kingdom via the Suez Canal to Far Eastern and Australasian ports, making a circuit of the globe via Panama. This combination would at the same time provide a very complete system by means of which the trade of West, South and East Africa, both sides of South America, Central America and the West Indies, would all be co-ordinated as integral parts of a remarkably complete network of shipping routes, giving facilities, under one management, for handling, or at any rate competing for, under peculiarly advantageous circumstances, and with the benefit of long tried experience and knowledge, the shipping business of some of the greatest markets in the world. American ship-owners would find that a combination of this strength would be extremely difficult to compete with, its resources and elasticity would enable it to command existing freight, and to be the first in the field whenever and wherever new trades might be opened up.

On the other hand the American Government expect that with the opening of the Canal, the coal requirements of the west coast and the tropical parts of the Pacific will be supplied from American mines, and the coal all be carried in American bottoms, giving an impetus to American shipowning and shipbuilding. The practice now is for these markets to be supplied almost entirely with Australian or Japanese coal. A large number of ships are employed to carry the coal to these ports, practically as ballast, which means that the rate of freight paid is low, but the ships carrying on this trade have the advantage of not going absolutely in ballast, and so having to earn a profit entirely out of the return freight. Should this expectation be confirmed, it will undoubtedly give a great advantage both to American shipping and to American trade as a whole, since low freights in both directions ought to foster exchanges, and so American manufacturers might benefit at the expense of the English and German who at present hold these markets.

Again it is expected that modifications may occur in the woollen industry. Both the cotton and silk manufacture have made greater progress of recent years than the woollen, but that industry has been slowly developing, and it is hoped that the Canal may lead to a yet greater advance. At present London is the great wool market of the world, and Americans interested in the woollen industry have to attend the sales in London in order to get their supplies of the finer wools, notably those from Australia. Wool purchased in this way, it is said, has to traverse long distances unnecessarily, and is subject to additional expenses caused by transhipment, warehousing, and handling. It is hoped that, with the saving of distance effected by the new route, a second wool market may be formed at New York, and that thereby the American industry will obtain cheaper raw material. This on the face of it has the appearance of probability, but it should be noted that there is already a tendency for the raw wool market, owing to the spread of the woollen manufacture, to become increasingly decentralised. There are wool sales now at both Liverpool and Bradford, as well as at London. Much wool intended for Yorkshire goes to ports conveniently situated, such as Hull. The French woollen industry, too, is beginning to get its supplies direct, some wool being transhipped at Port Said, and thence transported to ports like Mazamet. When the American woollen industry has a demand for Australian wool that warrants a direct supply, it will be arranged for whether the Panama Canal be open or not. There will doubtless be a tendency after Panama is opened to argue "*post hoc ergo propter hoc*," but this argument will not in all cases bear inspection.

4. *Fuel Stations, Coal and Oil*

In judging as to the possible commercial rearrangements that may result from the opening of the Panama Canal, it should be borne in mind that it is unusual to find a trade route on which the quantity of cargo to be carried in both directions is anything like equal. The Far East demands in bulk considerably more than it supplies in return. The United States and Canada export very much more in quantity than they import. The same thing is true of trade after trade, and the result is that ships and steamers have to go frequently from one port to another, perhaps a very considerable distance, in ballast. Bound up with this fact is one of the secrets of the unique development and prosperity of the British mercantile marine. The United Kingdom produces large quantities of coal, and this can be carried very cheaply to distant parts of the world where coal is lacking. By loading a cargo of coal, a ship avoids the necessity of going in ballast to certain ports, and any freight carried in this way is money gained. In transport services, if either ships or railway waggons have to go empty in one direction, the rates charged must be considerably greater than if there be a return load, and thus any rate of freight, for the possibly empty journey, is an advantage. It is owing to this that there are low transport rates in certain directions both on shore and at sea. Of the freight carried by shipping rather over one quarter of the weight consists of coal, and English coal, transported mainly by English ships, is to be found almost all over the world.

There are signs that the United States realise fully the advantage that the coal trade is to Great Britain, and undoubtedly, in connection with the opening of the Panama Canal, a great effort will be made to increase the demand for American coal, not only at the terminal ports of the Canal itself, but at all the coaling stations connected either directly or indirectly with the new routes. No doubt it is hoped eventually to gain for American shipping all those advantages which now and for so long have benefitted the British ship-owner. To the extent to which it is found possible to displace British coal in foreign markets and coaling stations, American trade should, in the first instance, experience a proportional gain, and on the strength of this, it is no doubt hoped, would be able, with comparative ease, to take up a position of greater importance in the sphere of ocean transport. Thus, in the immediate future, there will undoubtedly be a period of very keen competition in the various coal markets of the world, and it is of the greatest importance to the commercial and industrial interests of this country that our position be maintained. British colliery proprietors and the miners' unions will be on their trial, and the issue at stake will be the future well-being of the whole country. The position should be made perfectly plain to all who have a voice in shaping the relations between capital and labour in this great industry, in order that they may realise to the full their responsibility.

The recent visit of one of the leading British colliery proprietors to the United States was probably very directly connected with this question, and shows that the employer is aware of the critical nature of the new situation with which Great Britain will shortly be faced. A table showing the various types of coal, together with their price and conditions of bunkering at some of the principal coaling stations for the year 1912, will be found at the end of this volume. In considering the question which has just been outlined this table should be consulted, as it shows the economic limit to the demand for British coal.

The United Kingdom exports between sixty and seventy million tons of coal each year, and in addition to this sends another twenty million tons abroad for the use of her ships engaged in foreign trade. This gives an immense volume of steady freight which is a great advantage to British shipping. This trade, however, is passing through a stage of transition. Nearly every country is looking seriously into its fuel resources, and in the near future there will be a great fight for supremacy between coal and oil. Coal itself will be subject to modification, and some experts are of opinion that before many years are over it will be exceptional to find coal in use in its raw state away from the district in which it is mined; gases and oils of various grades will be the main products of the colliery. Will America, as a fuel producing and exporting country, be able to oust Great Britain from her present position in foreign markets? The solution of this question will have a very marked effect on the future commercial history of the world. The United Kingdom, in spite of its great coal resources, is small compared with America, but the British Empire has vast districts rich in coal and oil resources which are hardly yet known, and for the utilisation of which, so far, only the surface has been lightly scratched. With increasing commerce the United Kingdom may, and probably will, hold her own, and it may be from the Dominions beyond the Seas that America will meet the keenest competition in this other respect. Australia, India, British Africa, and most important of all, Canada, have the possibility of competing for the supply of fuel for the mercantile marine of the world. The next few years promise to be very full of interest on this subject. What form of fuel shall be used, how and where shall it be produced? The old method, wasteful not only from the moment the coal is mined until it is consumed, but in almost every connection, the space occupied, the labour required for handling, the dirt and discomfort entailed in its use both ashore and afloat, is coming to an end. The First Lord of the Admiralty has foretold the complete substitution in the near future of oil for coal in the Royal Navy. This policy might be one of expediency so far as the navy is concerned, and yet might not be an economic possibility for the mercantile marine, where every item of cost is of moment. But, when once liquid fuel is available in sufficient quantities[1] and at a suitable price, there will be no hesitation in substituting it for coal, and its employment must become universal when the internal combustion marine engine is perfected. All this is but a question of time, and the probability is that the time will not be long.

At the present moment, however, coal holds the field, and the practical question for the next few years is, how the coaling stations on the various routes shall be supplied. Price and quality in the coal supply will vitally affect trade routes. It is therefore of great interest to look at the question of routes from this standpoint. The coal prices for the year 1912 at various ports show, that so far as the Australasian and Far Eastern trades are concerned, the British Empire has a supply and facilities unequalled by any other country. At the South African coaling ports good coal can be obtained at from thirteen to fourteen shillings per ton. Australia can supply good coal from eleven shillings and sixpence. On the Suez route the supply is British, and from West to East prices increase, until at Colombo, Eastern coals begin to compete. East of Singapore competition ceases so far as coal from the United Kingdom is concerned. As to prices on the route, Gibraltar offers supplies of the best Welsh steam coal at twenty-three shillings, or Durham at twenty-one; at Port Said the prices are twenty-six shillings and twenty-two and sixpence.

[1] *Cf.* Messrs H. E. Moss & Co.'s *Steam Ship Circular*, January 1st, 1914, last paragraph.

At Colombo good Indian coal can be obtained at twenty-one shillings, and Welsh at thirty-five. If a cargo steamer has to return to Europe round the Horn, she can get good coal at Wellington, and at Monte Video can replenish her bunkers with sufficient Welsh coal at forty-one shillings to complete the voyage. But to compensate for this rather high price she can usually obtain freight to fill up empty cargo space. The United States coal supplied to American ports is undoubtedly cheap; for instance at New York and at Mobile thirteen shillings, at New Orleans fifteen and sixpence per ton. In the West India islands it can be purchased at about twenty-three shillings per ton, and at Bermuda at from twenty-nine to thirty-five shillings. At Colon the present price is about seventeen shillings.

All the facts and figures connected with the fuel supply of the different routes have been very carefully dissected by experts employed by the American Government. It is realised that the fuel supply will have a very great effect on the traffic passing through the Canal. To put it briefly, it is estimated by the Americans that Pocohontas coal as compared with South Welsh for steaming purposes is as 95 to 100, and that even allowing an extra half dollar per ton to cover the expenses connected with a big coaling station and the machinery for expeditious bunkering, it will be possible to supply steamers with good quality coal at the comparatively low price of about nineteen shillings per ton at either end of the Canal.

It is pointed out in the Government reports that there must be adequate arrangements for supplying fuel to the navy, and that while this is being done there should be no great difficulty in arranging for extra accommodation so that merchant ships may be able to obtain their fuel at the same depots. The report adds that it seems certain that coal can be profitably sold by the United States Government at Cristobal and Balboa, at prices less to the extent of $1·75 at Cristobal and $1·25 at Balboa, than those at Suez. Cheap coal at Panama will accomplish as much as low tolls in building up the industries of the countries whose trade will not be tributary to the Canal. To illustrate the expected saving in coal by using the Canal, a ten-knot cargo steamer of 4640 tons gross is taken, making a voyage from New York to Manila, first via Panama and then via Suez. The distance to be traversed in each case is about the same, the actual mileage being via Panama 11,620, and via Suez 11,440. The coal bill at present prices via Panama, says the report, would amount to 18,222 dollars, but via Suez, owing to high prices at Port Said and in the Mediterranean, it would amount to $20,868. Thus on the coal bill on this voyage there would be the considerable saving of $2646, due mainly to the possible low cost of coal at Colon. And it is pointed out that with growing trade, and consequently a greater demand for coal at Panama, the price might be reduced to even a lower figure. This is all very clearly put, but it does not refer to another possibility. Hitherto British coal has been practically free from competition on the Suez route, from the moment that the Panama Canal is opened a very keen and growing competition will be experienced. The effects of American competition have before this been felt in other industries, nor has the result always been to the disadvantage of the United Kingdom. This threatened competition in the overseas coal trade may have a very much-needed effect in making some of our collieries put their house in order. The coal industry of this country may be very effectually awakened by American rivalry, and the whole question of coal getting, the organisation of the industry, royalties, and the facilities for transport, storage, and loading, may be overhauled and revised with useful results. There is nothing better than a little healthy competition to make both capital and labour take practical views of the commercial situation. Syndicalists have congratulated themselves on having gained some influence among the miners. The publication of the *Miners' Next Step* in the year 1912 gave some colour to this. But a prospect of shrinking exports, caused by a forward policy on the part of America, will necessitate a different attitude between capital and labour in this country. The threatened stress of strenuous competition will compel master and men to work harmoniously together in order to avoid the wrecking of one of our greatest industries. In the interests of the Empire as a whole, and especially the United Kingdom as having the greatest industrial interests at stake, during the critical period of transition through which fuel has begun to pass, a transition likely to produce many acute phases before the normal is again reached, every nerve will have to be strained in the endeavour to maintain a leading position. British scientists and experts are at work on the question of how best to utilise the fuel resources of the Empire, and judging by the past, their discoveries will give the cue to the rest of the world. It is imperative, then, that a united front be maintained, and that there be no weak link in the armour. Any self-seeking policy on the part of either master or man merely plays into the hands of the enemy. All petty and unworthy jealousies and frictions must cease until the new era is fully disclosed and plans for the future can be efficiently and broadly laid. Meanwhile there is undoubtedly going to be a period of strenuous competition, and time alone can make known the result.

5. *Insurance Rates*

It is claimed that with tolls[1] comparing favourably with those charged by the Suez Company, with a cheaper coal supply, and lower insurance rates, the world commercial meridian, which, so far as actual steaming distance is concerned from London or New York, as has been seen, is marked on the Australian coast by the town of Port Lincoln (South Australia), will really be shifted considerably further

[1] But *n.b.* that from January 1st, 1913, the Suez tolls were reduced to 6 fr. 25 c., the equivalent of those proposed for the Panama Canal.

westward, and there will thus be given another great advantage to America. The question of tolls is presumably still in the air; the supply of coal on the rival routes has been examined; and now a few words may be said on the subject of insurance.

Insurance rates on both ships and cargoes are fixed after a consideration of the ship and her equipment, her commander, and the route she will traverse. But after taking all these into account there is another factor, namely competition: indeed competition has brought rates down to a point at which interested parties complain that they are unremunerative, and efforts are being made to improve the situation for the underwriters.

Looking at the various voyages, it will be realised that in the case of a vessel bound either from Europe, or from the east coast of America to a Western American port, the advantage of going via the Panama Canal, from the insurance point of view, will be considerable, and hence a lower rate may be confidently expected. It is true that going from West to East via Panama the Caribbean Sea will have to be negotiated, but the dangers there connected with navigation, and the possibility of tropical revolving storms and hurricanes, are less than the dangers of the Horn or the Straits of Magellan. Thus in addition to the distance saved, and other expenses decreased, insurance rates, too, will favour this route. But the saving in insurance will only be one factor among several, and it would not by itself affect the decision as to the route to be taken. When, however, a voyage to Australia or the Far East is contemplated, and it is these voyages that are here in question, the conditions and circumstances are very different. It has been asserted that here insurance rates will have some, perhaps considerable, effect in settling whether the Suez or Panama route shall be taken, and it may even influence the placing of orders where competition is very keen and prices cut very fine. At the present time the insurance rates on goods to Australia and New Zealand vary widely according to the ship on which they will be carried, and the route which she will take, indeed there is as much as 50 per cent. difference in the quotations. Inquiries among underwriters, as to what their attitude will be when the Panama Canal is open, elicit the information that while on the one hand, the dangers of the Caribbean Sea and the novelty of the Panama Canal will not add to the insurance rates on either ships or goods taking that route, yet on the other hand, ships and goods going via Suez will be quoted the same terms, other conditions being equal. The rates via Suez are at a point below which one is assured that they cannot fall: thus ships and goods going via Panama could not obtain a more favourable quotation, and, as has already been mentioned, there is an all-round tendency to increase rates. Thus so far as insurance rates are concerned, neither route would presumably be able to offer any advantage for the competitive trade of Australasia and the Far East.

At the moment of writing there are rumours of delays in the opening of the Canal owing to physical difficulties. These rumours may or may not be well founded, for the official reports are as confident as ever as to being able to open the Canal to time. The rumours, however, have led some members of Lloyds to say that they will be careful as to taking risks via Panama, and in fact some go so far as to say that under existing conditions (whatever that phrase may mean) they will not be prepared to effect insurances via Panama. This shows that, at any rate until the Canal is a well-established feature in ocean routes, it is probable that insurance rates will favour ships and cargoes going via Suez.

6. *The Political Factor*

A study of the interests at stake in international trade and shipping brings out clearly and unmistakeably the fact, that here, as in every other sphere in the material world, there are economic laws to be reckoned with. The laws may be modified to a certain extent by various expedients (tariffs or navigation laws, to mention but two), to the advantage of some interest or even of some nation, even though it create an uneconomic situation for the world as a whole. Generally speaking, however, Government interference on matters affecting trade and commerce should be reduced to a minimum, nor should a State *directly* take an active part in fostering industries or restricting competition either at home or abroad, except under very exceptional circumstances. One of the great and growing needs of the present day is the independent spirit, both in the individual and in the group. In any sphere, the highest development is seldom attained where the conditions are forced and unnatural.

During the past thirty years there has been a remarkable development among the more progressive nations. Of the three which more particularly are competing for the commerce of the world, Great Britain has greatly developed the Imperial idea. A new epoch has been opened up in the history of her chief colonial possessions, in the first instance through consolidation and increased dignity of status. Australia, New Zealand, and South Africa, have, following the precedent of Canada, developed into Dominions. The significance of that change is summed up in the Royal Title, which, during the reign of Queen Victoria, was: "Victoria, by the Grace of God, of the United Kingdom of Great Britain and Ireland, Queen, Defender of the Faith, Empress of India." But on her death the title was modified to: "Edward VII. of the United Kingdom of Great Britain and Ireland, and *of the British Dominions beyond the Seas*, King, Defender of the Faith, Emperor of India." In a word, during recent years the British Empire has entered upon a process of consolidation, the full effects of which, political, social, and commercial, cannot at present be estimated.

Nor has this movement been confined to Great

Britain. It has made itself felt in the United States, where the form it takes is a desire for extra-territorial expansion, and the intention to be supreme on the Pacific. After the Spanish-American War, the United States found that a new situation had been created. Willing or unwilling, she had entered upon an enterprise in world politics which would henceforward change the self-centred, self-contained State, hitherto contented with development on the North American continent, into a growing world-power. The acquisition of the Philippines, and the bid for the supremacy on the Pacific, of which policy the construction of the Panama Canal is one part, have a deeper and more far-reaching meaning than the majority of Americans perhaps even yet realise.

Germany, too, has felt the contagion of example, hence the inauguration of a spirited "Welt Politik," and an anxious search for a *place in the sun*. Bismarck mistrusted a policy of extra-European expansion. He neglected the possibilities which existed during his period of power of obtaining suitable areas for colonisation. But modern Germany has had to go back upon the earlier Bismarckian policy, and to-day the determination to be a colonial power is the explanation of the expenditure on the fleet, and of the nervous foreign policy which keeps all Europe in suspense.

The modern Imperial idea, to use an easily understood catchword, will be not the least of the factors in deciding the exact effects of the Panama Canal on commerce and trade routes. Already in the case of Canada, Australia, and New Zealand, the offer of a small amount of preference to goods manufactured by the Mother Country has had quite a considerable effect in stemming keen foreign competition, or at any rate in increasing the volume of trade with the United Kingdom. Professor Lincoln Hutchinson, who has studied this part of the subject on behalf of the United States Government, has presented figures showing the initial effects of this preference on Australasian trade.[1] During the last few years of the nineteenth century, of the total import trade into British Australasia, the United Kingdom held 75.3 per cent., the United States 14.2 per cent., and Germany 6.3 per cent. During the period from 1902 to 1906 the percentage of the United Kingdom of this same trade, and on an increased total, fell to 71.6, while that of the United States increased to 16.9, and even that of Germany rose slightly to 6.7. But during the period 1907 to 1911, whether owing to this preference as the Professor thinks, or owing to greater alertness on the part of both the English manufacturer and the Australasian buyer, the percentage of the United Kingdom, on a considerably increased total value of imports, was 73.5 as against 15.3 for the United States, and 7 for Germany. It will be very interesting to follow up these figures, and ascertain whether the increased share of the trade enjoyed by the United Kingdom will be maintained and further increased. The consolidation of the Empire, in so

[1] *Cf. Journal of the Royal Statistical Society*, March 1913, p. 383.

far as it is genuine and fundamental, should have a progressive effect on trading relations, at any rate, up to the point at which any of the greater Dominions tend to become self-sufficing economic units.

In the case of the United States there is an instance of capital importance showing the effect of the political factor. Since the Philippines [1] have been attached to the United States, the imports into those Islands have considerably increased, but whereas in 1897 the United Kingdom and Spain held the principal rôle there as traders, the United States has become easily first, on a larger total value, having increased her percentage from 16.7 to 60.9 between the years 1897 to 1911, while that of Spain, has in the same period, decreased from 38.9 to 8.7, and that of the United Kingdom has fallen from 33.3 to 23.9. This is a good exemplification of the saying that trade follows the flag, especially if backed up, as in this instance, with preferential duties and other favouring conditions.

The effects of the political factor, too, may be seen in the extraordinary changes wrought by the modernising of the Far East. Japan, in a remarkably short space of time, has proved her capacity not only on the field of battle, but in the exercise of both industrial arts and her performance of commercial services. This opens up a larger subject than it is here possible to treat fully, but already there is a growing antagonism between America and Japan in the Pacific. And with the refusal

[1] *Cf. Journal of the Royal Statistical Society*, March 1913, p. 384.

of white communities to permit the Japanese to settle on thinly-populated lands, and compete with white labour, the Japanese are, for the moment at any rate, being forced to concentrate their attention on commerce. The capital so much needed for the development of the Japanese Empire can, under existing conditions, be most readily accumulated through the operation of a mercantile marine. The initial effects of this are already becoming evident. The full effects will be seen when China settles down under an orderly Government. Chinese iron and steel, to mention but one industry on which China has shown her ability to compete successfully with both Europe and America, will be transported in Japanese ships to all open markets, a prospect by no means relished by either English, American, or German ironmasters. The trade between Russia and China should also be kept under observation, for it gives promise of very considerable extension, and will in no way be affected by the new route.

The world is on the threshold of very far-reaching changes. The volume of trade during the next few decades may confidently be expected to increase by leaps and bounds. The point that should be insisted upon is, that when some years hence a retrospect can be usefully attempted, and the advance made be reduced to concrete figures, it will have to be remembered that although the Panama Canal was opened just about the time that great developments commenced, there were many factors co-operating to produce these great results, nor was the construction of the Canal the greatest of these, so far as world trade is concerned.

7. *Rates of Exchange*

In international trade, goods pay for goods, but the relation between various kinds of goods is, for trading purposes, fixed by money values. The great bulk of international trade is settled by means of Bills of Exchange, and Bills of Exchange, like all other commodities, vary in price according to supply and demand—the price of a Bill is known as the Rate of Exchange.

As the leading countries of the world now enjoy a gold standard, the possible rise or fall of the rate of exchange is definitely limited to the cost of transporting and insuring gold. Thus since it is possible to send gold from London to Paris at a cost of ten centimes per sovereign for transport and insurance, and as one British sovereign contains the same amount of pure gold as 25.22 French francs, the limits to which the rate of exchange between London and Paris can rise or fall are 25 francs 12 centimes and 25 francs 32 centimes.

By finding out the cost of transporting and insuring gold to any given place, it is possible to say what the limits of the rate of exchange to that place are. Thus trade between countries enjoying a gold standard is comparatively easily settled. Traders know exactly what they will receive or what they will have to pay. Some countries, for instance China, do not enjoy a gold standard. Thus trade between China and Europe or America is carried on under certain difficulties and with fluctuations, which at times may even cancel, on a superficially profitable undertaking, the greater part, or even the whole, of the expected gain.

In the discussion on the paper read by Professor Lincoln Hutchinson before the Royal Statistical Society, to which reference has already been made, Mr Moreton Frewen enlarged upon this subject. He pointed out the effect of the present very low rate of silver exchange in contracting America's exports to China, and in expanding China's exports to America. From 1905 to 1907 the rates of exchange were high, and Chinese merchants were able to buy gold exchange in Portland or Seattle, and with this buy American steel rails, lumber, or flour. In the year 1908 exchange fell considerably, with the result that during 1908 and 1909 the exports of these commodities to China almost ceased. The reason for this was that in 1907 a Shanghai merchant was able to buy a thousand feet of good dressed Oregon lumber in Portland for $30 gold, which cost him at the rate of exchange 35 taels. In 1908, however, the rate fell, and the merchant would have to pay as much as 48 taels for $30 gold. As a result, when requiring lumber, he went to Manchuria, where the price for 1000 feet of similar wood was 39 taels.

Mr Frewen urged the importance of studying the question of rates of exchange very carefully, for unless silver recovered its exchange value, not only would China not be able to purchase from Great Britain and America, but she would become an exporter of all kinds of goods which to-day are produced by white labour.

It may presumably happen that owing to some unforeseen occurrence, within a few years of the opening of the Panama Canal, silver may recover its exchange value. In that event, a considerable trade may be developed between China and gold standard countries. The cause of this trade would be altogether apart from the opening of the new route, but some people, if satisfied with a superficial study of the subject, might conclude that it was entirely due to the greater facilities opened up by the piercing of the Isthmus.

8. *Finance, Banking, and Investment*

It has been estimated that the people of Great Britain have a sum of about £2,500,000,000 invested abroad. This vast sum has been advanced partly to our own Colonies and Dominions, and partly also to new or needy countries in every part of the world. Wherever there is fairly good security and the chance of a reasonable return, Englishmen are usually willing to supply capital. In making advances of this nature, it is usual to stipulate that the interest shall be paid in gold, but the merest tyro in these matters knows that it would not be possible either for the creditor nation to export golden sovereigns to the extent of the sum advanced, or for the debtor states to ship golden sovereigns in payment of the interest on their debts. The original sum advanced leaves the shores of the United Kingdom in the form of goods, railway equipment, constructional material, textiles, and other manufactures. The interest, too, comes to these shores in the form of goods, the goods in both cases being covered by bills of exchange in terms of sterling. The State needing capital thus obtains what is necessary for its development, and, when the interest becomes due, it can be collected by the creditor in gold, through banking establishments. In this way there have been built up and strengthened trading relations which will exist not only so long as the indebtedness continues, but thanks to good relations on both sides, are likely to be permanent. To illustrate the importance of this factor in international trading relations, one has but to refer to the States of South America.

In the early days of last century the Spanish Colonies in the Americas began to throw off the sovereignty of the Mother Country. Great Britain had just emerged successfully from the great contest with Napoleon, and had freed Europe from a hateful tyranny. The newly established Republics across the Atlantic were menaced with many dangers, and looked naturally to the saviour of European liberties, nor did they look in vain. Canning resisted the blandishments of the Holy Alliance, and, going a step further, suggested to the United States the policy which has developed into the *Monroe Doctrine*. The infant Republics required capital in order to develop their resources, and rather from sentimental, than from business, motives, British investors began to favour *South Americans*. Millions were advanced, and much of what was advanced was lost. But Great Britain obtained a stake in these countries which has never been lost, indeed during recent years it has considerably increased. British capital was in far too many instances misapplied, still it effected such work of development as was attempted. The openings for trade thus created were utilised by the British ship-owner, and hence it was British ships and steamers that developed the trade on both the eastern and western sides of South and Central America. The economic forces at work acted and reacted upon each other, with the result that, in shipping and in trade, the United Kingdom has been easily first in these regions during the past century. Of recent years there has been a growing competition in these markets, but this competition does not, as might have been expected, come principally from the United States, but from Germany. And the reason for this is a further demonstration of the efficacy of foreign investments in building up trade. Germany has become a rich country, and has capital to spare for foreign investment. German financial investments in South America have had the same effect on trade as our own. Nor is it conceivable that commercial relations so well established on mutual advantage, and strengthened by common interests, as are those of

Great Britain and Germany in South America, will easily succumb before the efforts of the United States, a country viewed with some jealousy by the pseudo-Republics of the South; even though those efforts are supported by a new trade route offering certain advantages of a more or less one-sided nature.

The effect of the Canal on the progress of western South America is bound to be very considerable, but one feels doubtful as to whether the full measure of the increased trade will be reaped by the United States. Not only has Great Britain a vast amount of capital invested abroad, but in the comparatively backward countries which British energy and capital have been developing, it is British banking facilities which have smoothed the wheels of trade. A good banking system is inseparable from a healthy system of modern commerce. In the Far East and in South America it is Great Britain that, in developing the latter, has established the former, and has thus built up another bulwark against the attacks of commercial rivals who have entered the lists later in the day. In market after market it is the British trader who is on the defensive. He is charged with having gone to sleep owing to long continued prosperity and the lack of competition. Once or twice indeed he has been caught napping, and rivals have succeeded in gaining a footing in markets where hitherto he had been practically supreme. But there still remain many advantages which, if rightly employed, should enable the Englishman to more than hold his own. The financial and banking establishments in various parts of the world under British control, and the mass of British foreign investments are among these; thus although it may be true that a certain somnolence had at one time lessened the energy of the British trader, the signs of the times seem to show that that phase has become a thing of the past.

9. *The Human Factor* (*Manufacturing and commercial ability*, *experience of trade and markets*, *present possession*).

World shipping is mainly carried on by Europeans, and in this at present Great Britain comes easily first, with Germany a modest second. The supply of manufactured goods for the world market is also mainly in the hands of Europeans. In both these spheres Great Britain has some very special advantages, which will mean much, should competition continue to increase in intensity, and there is every indication that it will.

No trade can be learnt in a day, nor can a market be induced to sample a new brand for the asking. In the United Kingdom there are industries and manufactures which have flourished for centuries. The industrial revolution has, it is true, wrought many and great changes in methods of manufacture. The machine takes the place of the hand tool, but on the whole the main change effected has been to carry still further the process of division of labour, with the result that though there is employment for a large amount of unskilled and semi-skilled labour, there is a greater demand now for skill, and for skill of a far higher kind than there ever was before. Heredity, too, very vitally affects this question. Skill in metal working, or textile weaving, does pass from father to son in a very remarkable way, with the result that in these islands there is a force of highly skilled labour in certain trades, such as no other country possesses, and the world has never previously seen. Moreover English manufactured goods are well-known, and their excellence is thoroughly appreciated the world over. Foreign competitors show their respect for British skill by endeavouring (often successfully) to lure it to their own shores.

Nor is it the labour force alone that is a matter for legitimate pride to this country. The British manufacturer and commercial man have again and again proved their capacity for organising markets, for the collection of the raw material, in the production of a commodity of the highest quality, and what is equally necessary, in finding a market where, not only will an English manufactured article be sold, but where it will continue to be in demand. For decades there was success all along the line, and this success resulted in a certain carelessness of attitude, as to foreign rivalry. For a time a series of pessimistic reports were current. The British exporter was losing ground, new countries were successfully competing and building up trade at the expense of the lethargic Britisher. Such a stage was natural; it was bound to come. Other nations desired wealth and required capital for development, and the very feeling of security enjoyed by the British manufacturer and exporter gave the opportunity for foreign rivals to make some headway. The situation was, and is, very interesting. Where some observers fall into error is in thinking that foreign developments must be made at British expense. Entering a market where hitherto it had enjoyed no custom, the percentage supplied by a new-comer might increase rapidly, whilst the figures of the old-established exporters remained almost constant, or showed but a small increase. In some cases, notably in South America, the United Kingdom has experienced somewhat of a set-back. There, however, security had led to somnolence, from which the Englishman is only just beginning to awaken; but he does realise the situation now, and is prepared not only to hold his own, but to have his full share of the increase in these rapidly developing countries.

Both so far as the supply of markets is concerned, and the transport services to these markets, the Englishman is, for the most part, the man in possession. He has built up a great manufacturing and shipping connection, and although no country can hope to enjoy permanently the position of the workshop of the world, and at the same time enjoy a supremacy in the ocean transport services, yet there are sufficient indications to prove that the decline of Great Britain, either industrially or commercially, has not yet commenced, nor is there any apparent reason why she should not hold her own for many a year to come. In the sphere of international trade, the English business man with his honourable dealing, steadiness of purpose, freedom from the speculative habit, and methodical way of carrying on affairs, is a great factor with which the rest of the world could ill afford to dispense. Some of our competitors are too apt to follow the will o' the wisp, others have but little initiative, though a great capacity to follow where pioneers have led. A broad survey of the world of business to-day, warrants one in asserting that it is the Englishman that keeps things on sane and wholesome lines. He is at the same time the ballast, and the commander, of the ship of trade.

The very satisfactory figures for British exports during the past few years tell their own story. Skill in manufacture; freedom to buy in the most favourable, and sell in the most advantageous markets; a labour force both well paid and well fed, well paid because living is cheap in this country, and well fed because the whole world is under contribution to supply the needed foodstuffs, which are willingly supplied because the market is both sure and good; the possibility of obtaining raw materials, half-manufactured goods, and manufactured parts ready for fitting together; the power of London as the financial centre of the world; all these factors have contributed in building up a position that will be able to withstand a considerable amount of attack.

Conclusion

In conclusion there can be no doubt that the opening of the Panama Canal will effect much for the New World. Development on the west coast of America, both north and south, will receive a great impetus. Hitherto emigrants from Europe have felt that the distance and journey to these parts made the western less eligible than the eastern side of North America. The improved sea voyage should do much to remove this prejudice. Local trade, too, should be greatly increased; facilities in transport doing much to develop trading relations between the east and west coasts. Both England and Germany will feel growing competition in the supply of manufactured goods in South America, especially in the Republics on the west coast.

Very great benefit will undoubtedly accrue to the West Indies. The West Indian Islands include Bermuda, the Bahamas, and the Greater and Lesser Antilles. Of these Bermuda and the Bahamas belong to Great Britain; Jamaica is the chief of her possessions in the Greater Antilles, whilst the principal islands of the Lesser Antilles are all British. In the same region Great Britain has British Honduras and British Guiana, both on the mainland. All these, but especially the islands, must very materially benefit when the Isthmus of Panama becomes a thoroughfare.

Since Mr Chamberlain appointed a Royal Commission in the year 1896 to visit the West Indies and thoroughly report as to their existing condition and prospects, these, the oldest of Great Britain's colonial possessions, have grown in public interest; and owing to the impetus given by Mr Chamberlain's policy, considerable progress has resulted. Still these possessions were situated, as it were, in an ocean "cul-de-sac." The trade has in the past depended to a great extent on local demands and local industry in producing food stuffs and raw materials for other parts of the world. The sugar industry, once the great backbone of West Indian trade, has passed through a long period of depression, and gives but little indication of regaining its old importance. Raw cotton, fruit, cocoa, with perhaps some coffee and less tea, are the main agricultural products. Of recent years, however, mineral oil has been worked at Trinidad and some of the other islands. The oil trade may become for the West Indies what the sugar industry at one time was. Especially does this promise to be the case when, instead of being situated towards the end of a cul-de-sac, these Islands are on one of the great highways of the world's trade. A wise policy can do much to make these the fuel stations for a great part of the shipping making use of the Canal route. It should be possible to supply American coal on the Islands at the same rates as at the coaling ports connected with the Canal, unless the American Government, in the supposed interests of the Canal, arrange for an artificially cheap rate for coal at their own depôts. Later on the Islands, owing to the local supplies, should be able to attract a large part, if not all, of those ships which either use oil fuel or have internal combustion engines. The political factor will doubtless make its influence felt here, but British and many foreign ships will, owing to the convenience of situation and the growing trading possibilities, undoubtedly make use of the Islands, especially if they are equipped with up-to-date facilities not only for trade, but for dry-docking, repairs, and bunkering. Taking a comprehensive view of the new situation created by the Canal, it would appear that the Islands must grow both in commercial and in strategical importance, attractive alike both to population and to capital. So much briefly for the local effects of the Canal.

The effects on world trade can easily be exaggerated, indeed in many of the reports and estimates drawn up this has already been done. If the new régime in the United States should succeed in freeing her trade and industries from a protection under which shipping is severely handicapped, it might come to pass that, if it were found practicable to supply suitable coaling stations along the routes with good cheap coal, a heavy blow would be dealt, not only to the Suez and Cape routes, but English and German shipping would find competition so keen that they would have to fight for very existence. A survey, however, of commercial history tends to reassure one. A position, which is the result of centuries of growth, can only cease to be effective when it is attacked not only from without, but is subject also to internal decay. At the present moment neither British manufactures nor shipping show any serious signs of internal weakening. On the contrary, trustworthy indications warrant the assertion that at no previous time was the nation more fitted to occupy and enlarge the great position that is the heritage of many generations.

It must be remembered that there is the great question of the awakening of the Far East to be considered in connection with this new route. At the moment, it is true that China is in a state of political unrest which is a serious handicap to trade developments. But this state of affairs can only be temporary. In a few years time one may expect to find China settled down under an orderly system of government. Already the Chinaman has shown his capability in the heavy industries. Iron ore and coal are apparently abundant in China. High class ore is produced within forty miles of Hankow and can be put on railway trucks by Chinese labour at a contract price of 5d. per ton. Chinese pig-iron can be produced at a cost which permits it being sold f.o.b. at Hankow at about £2, 10s. per ton. America has already been importing this pig in large quantities. Chinese labour is stated to be within ten per cent. of an equality with the best white labour, and its cost is in comparison very cheap: one report says that wages are one-fifteenth of those paid to white labour at Pittsburg. In a state of political peace, the Chinese should be able to develop enormously their manufactures; and the time may come when not only Chinese pig-iron, but Chinese structural steel will invade the American markets. The Panama route will assist in this, but one doubts whether the Chinese exports will be transported in American bottoms. The Japanese are being forced to be a commercial nation, and it is rather to be expected that it will be Japanese shipping steaming via Panama that will perform services of transport between the Far East and the North American east coast. That the above forecast is not without some foundation, the following extract published by a London daily paper in May 1913 seems to show:—

"The President of the American Steel Trust stated before a Government Commission yesterday, that Indian pig-iron is being imported into the United States at a total cost (including manufacture, freight, and duty) of a little more than half the price of the same material produced by the Trust.

"At present the Indian pig-iron can only be landed at this cost on the western coast of the United States, but the opening of the Panama Canal towards the end of next year will bring the Indian producer into direct competition with the manufacturers in the Eastern American States.

"NEW YORK, *Tuesday*.

"Mr J. A. Farrel, President of the United States Steel Trust, continued his evidence to-day in the suit by the Government for the dissolution of the Steel Corporation.

"Mr Farrell stated that pig-iron could be manufactured in India and laid down in Calcutta at 24s. 6d. per ton. There was now under way from Calcutta to San Francisco the first cargo of Indian pig-iron ever brought into the United States. The freight rate was 22s. 11d. per ton, and under the new tariff the duty would be 5½d. per ton.

"Thus the pig-iron could be laid down in San Francisco at a cost of about 47s. 11d. per ton, and Chinese pig-iron could be similarly supplied at 44s. 11d. per ton, while the present market price of pig-iron on the Pacific coast was 89s. 7d."

The world is on the eve of great things full of great possibilities, probably the greatest being the awakening of the Oriental. At the moment that this awakening is in progress, America, with splendid energy, regardless of money cost, and really regardless of the possible ultimate effects upon world commerce, has taken in hand the cutting of the Isthmus of Panama. This act is awakening the western world, for it is already making the leading commercial nations consider not only new possibilities, but review old established ways and methods. It may well be that the greatest effect of the great engineering feat, now being rapidly brought to a successful issue by American genius, will be the indirect one of awakening the white man. Thus in an age that can rightly call itself progressive, there is to be more progress, new spheres will be developed, whilst the old also will be reviewed. The result of the present transition which is affecting both Occidental and Oriental must be the raising of the world as a whole to a higher plane of civilisation, the West and East in closer contact, acting and reacting upon each other, bringing in a new era of peace and prosperity, and the enlarging of life in its highest spheres.

CHAPTER X

COALING STATIONS

A DESCRIPTION of the main trading routes used by British steamers would not be complete without some mention of the arrangements which have been made for the supply of coal. In the early days of steamships, two great problems had to be faced, how to produce a marine engine and boiler consuming a minimum of coal, and where to place stations along all the main trade routes where steamships might conveniently, economically, and speedily replenish their bunkers. This latter problem raised many very interesting considerations. Fifty years ago the coal resources of the world were not so well-known nor so scientifically exploited as they are to-day, and it is safe to foretell that the next few years will bring about very considerable changes not only in the condition of coal supply, but in the sources whence that supply is obtained; whilst the greater question of a radical change in the fuel consumed by shipping is looming in the near future. It would have been a comparatively simple matter to take a map of the world, and mark with red ink places at suitable distances along the main ocean routes, as being convenient for the purpose of fuel stations. But in addition to settling on the place for a fuel station, it was necessary to decide whence the coal supplied there should be obtained. It was obvious that along the Mediterranean and the Suez route, coal would have to be transported from a considerable distance, and thus it must be decided what coal would be the most economical to use at a given part of the world. The cheapest coal is not always the most economical, indeed very frequently the very contrary is true. Cheap coal may be bulky, quick burning, and an unsatisfactory agent for raising steam. A comparatively dear coal may be just the reverse of all these. It may therefore pay to send the best South Welsh steam coal quite a long distance rather than use an inferior coal [1] mined almost on the spot. The necessity to reduce the bunker space to the smallest possible dimensions has had much to do with the popularity of Welsh steam coal for shipping purposes. Only to mention the advantage this coal possesses in point of bulk, while one ton of it measures about forty cubic feet, one ton of coal of inferior quality may measure as much as forty-seven cubic feet. In the case of a steamer having a consumption of say sixty tons a day, the saving of space effected by using the superior coal on a long voyage is considerable. Other factors, too, operated in the first instance, and have had a continued effect. Some of the best coal fields of the United Kingdom are conveniently situated near the sea coast. Then

[1] *Cf.* Appendix, No. 12.

again it has been British ship-owners who in the first instance made use of the steamship for long ocean voyages. A great export trade in coal was developed by this country long before other countries were ready with steamships to enter into competition for the carrying trade of the world. Thus it has come to pass that English coal has been procurable even in the most distant markets. The conditions of the freight market, too, have been by no means a slight factor in bringing about this result. The industries of the United Kingdom require large quantities of bulky raw materials, and the large town population requires more food stuffs than the country population has been able to produce. It is true that large quantities of manufactured and semi-manufactured goods have been exported, but the raw materials and food stuffs imported have necessitated the employment of a far greater tonnage capacity than has ever been required for exported manufactures. In a word coal exports have been of a very great advantage in building up the world commerce of Great Britain. As has already been pointed out in some detail, the fact that there is a cargo of coal to carry outwards, even though carried at a comparatively low rate of freight, has been a great factor in reducing homeward freights. Indeed coal, since the era of the steamship began, has been one of the great factors assisting the phenomenal growth of British shipping. At the present moment, when competition is threatening to become critical, it is impossible to give too much attention to this subject. As one time German coal was produced entirely for home consumption, it now competes with British coal, not only in the German shipping ports, but in the Baltic. American coal, although mined at a comparatively great distance from the sea, thus entailing a long land transport before reaching a port, can be mined so cheaply and handled so economically, that it has already invaded the Mediterranean market. Further, and this is of even greater moment, it can be supplied at the Panama ports, and possibly may be before long available on the whole Panama route, at considerably lower price than that at which English coal is available at Gibraltar and the ports along the Suez route.

Moreover, since the steamship first made her appearance, many new sources of coal supply have been tapped. On the Suez route, Indian and Japanese coal have become of first-class importance at certain points. The mines of South Africa, too, have become more productive, and the quality of the coal obtainable has very greatly improved. Hence South African coal not only supplies the home coaling stations, but is gradually extending its sphere of influence, going to the termini of the longest sea route. Australia and New Zealand are well endowed with coal, giving the promise of not only supplying all home requirements, but of competing in many of the coaling stations on the Pacific and Indian Ocean routes. Nor is the United States the only part of the American continent capable of supplying coal to the world market, for although the fuel resources of South America are practically unknown, even there coal is already being worked, and undoubtedly oil exists, probably in abundant quantity. But for the British Empire it is to Canada that one turns, nor is there likely to be any disappointment experienced as to the richness of her resources. Coal is produced both on the Atlantic and Pacific sides of the Dominion, and is available in ample quantities even now for shipping purposes. Nor are the central provinces of the Dominion less well supplied. Some experts do not hesitate to affirm that Canada gives promise of being one of the greatest fuel producing areas of the world.

There are also many smaller sources of supply to be found scattered about the Empire. In British Borneo not only is there workable coal, but a valuable promise of oil. In the West Indies, too, coal and oil undoubtedly exist in satisfactory quantities, and, in Trinidad especially, the Empire possesses resources which within the next few years will prove of the greatest value in aiding British shipping to hold its own on the new trade routes opened up by the Panama Canal.

Here, then, are opening up questions of the greatest possible interest, and of vital importance to the trade and prosperity of the Empire.

At the end of this volume will be found a map on which are marked the principal coaling stations of the world, and among the appendices is given a list of coaling stations with the conditions and price of supply of the various coals obtainable at each. It will be gathered from this that English coal is obtainable at all the coaling ports along the Suez route as far as Colombo and Singapore. But it will be noticed that while Welsh coal at both these ports is 35s. per ton, the local coal is considerably cheaper, and the best quality of Natal coal can be purchased at 10s. per ton less than Welsh. That the quality of this coal is good can be proved by the fact that it is used by the mail steamers of the Union Castle Line. And the quality is stated to be improving. At Singapore Australian coal sells at 11s. a ton less than Welsh. The lesson to be learned is that now that other sources of supply are being tapped, there will be a restriction of the area served by the old well-known qualities of fuel. The demand for Welsh coal is growing, nor need it necessarily suffer any decrease for many a long year to come, but with a greater commerce the demand will be restricted to a definite area, and will probably cease to be world-wide as it has been hitherto.

British ship-owners, even those managing the most important lines, do not as a rule attempt to supply their own fuel. It is usual to enter into yearly contracts with certain large coaling agents and contractors who have facilities for coaling steamers in most of the world's coaling ports. The terms of these contracts are interesting, because the ship-owner on his part binds himself to deal exclusively with the contracting firm in certain ports, and the latter bind themselves to give the ship-owner the benefit of lower prices, should prices fall during the duration of the contract. Thus the prices quoted may be said to be maxima. The usual form of contract is as follows :—

"Memorandum of agreement between Messrs A. B. & Co., hereafter called the Owners, and Messrs X. Y. & Co., as Agents for the firms named herein, whereby the said firms undertake to supply all Bunker Coals that the Owners may require for the use of their Steamers at the Ports named, and according to the custom of each Port, the coal not being for the account or use of time charterers, and at prices and terms named herein (except when steamer's charter gives charterers or their agents the right or preference to supply coals). The Owners, on the other part, bind themselves to take their entire supplies at such Ports, from the firms mentioned on these terms except when otherwise bound by Charter, as above. Should the general current price for best bunker coals at the time of Steamers coaling be less than that named herein, the Owners to have the benefit of same.

"In the event of the Act of God, War, Fire, Hostilities, Ice in Rivers, and/or Docks Strikes, Lockouts, Stoppage of pitmen or labourers, whether general or partial, and any other cause whatsoever beyond the personal control of the respective Suppliers affecting the working of this contract, the suppliers to be relieved during the continuance of such events from all obligations under this contract, unless modified by mutual agreement. Should Great Britain be engaged in war with any European or other Power this contract to be cancelled."

Steamers running via the Suez Canal to Australia take in sufficient bunker coal, before leaving England, to carry them to Port Said. At Port Said there are several coaling companies supplying nearly a million and a half tons of coal in the course of a year. The price quoted in the contracts for Welsh coal in the year 1912 was 26s., but during the year it was supplied at 6d. per ton less; during 1911 it had been supplied at 21s. and 20s. At Gibraltar during 1912 the contract price for Welsh coal was 23s. whilst at Suez it was 36s. These figures show the advantage of coaling at the western end of the Canal. Before the Canal was deepened, it was necessary for some steamers when fully loaded to replenish their bunkers to the east of the Canal, a fact which gave a great advantage to light draft steamers. This brings out a point of considerable importance in connection with the replenishing of a steamer's bunkers. The place where a steamer coals may make the difference between a profitable and a losing voyage. When freights are low and coal is dear, carefully managed steamers will carry as much coal as possible from an original coaling port; whilst on the contrary, if freights be high and coal cheap, there is every inducement to carry a minimum of bunker coal and a maximum of freight. The cargo steamer of average tonnage rises about one and a third inches a day owing to consumption of coal;

hence towards the end of a long voyage there may be considerable cargo space available, making it worth while to have a port of call on the homeward voyage if cargo can be picked up there.

The coal at Port Said is sent alongside the steamer in barges, some of which have a capacity of as much as 300 tons. The actual operation of coaling at this port is a most interesting sight, especially if carried on at night time. Hundreds of black figures, with a minimum of clothing, run at a remarkably fast pace along planks from the barge to the steamer's deck, carrying coal in baskets on their heads. On a dark night, with artificial lights, the scene is most weird. And the celerity with which a large quantity of coal is shipped is astonishing. It appears to be the experience that, where labour is cheap and abundant, this method of coaling is the most satisfactory.

Having coaled at Port Said the steamer would run as far as Colombo without requiring to take in a further supply of fuel, but should there be any necessity to do so, it would be possible to coal at either Suez, Perim, or Aden. At Colombo, English coal comes into competition with coal from India and South Africa, thence the voyage is made without a stop until Australia is reached. Coal appears to be well distributed in Australia, indeed it is found in all the States of the Commonwealth, as well as in New Zealand, but hitherto it is the coal of New South Wales and Western Australia that has been of the greatest value to shipping. Newcastle, New South Wales, is the great coal centre of Australia, but there are collieries nearer than Newcastle to Sydney, from which very good bunker coal is produced. In Western Australia the chief coaling ports are Fremantle and Bunbury, whilst in Queensland there is not only the promise of good supplies, but already appreciable quantities of both bituminous and anthracite coal have been produced, and there is a growing demand for coal at the Queensland ports for shipping purposes. As has been already noticed, Australia exports quite a considerable quantity of coal to Far Eastern ports and also to South America—this is mainly from Newcastle, New South Wales. In the year 1910 Newcastle, New South Wales, exported over four and a half million tons valued at £2,459,000.

The growth of the industry can be gathered from the fact that whilst in the year 1881 the total coal production of Australia was less than two million tons, in the year 1910 no less than ten million tons were mined; the value at the pit's mouth is about 7s. 6d. a ton, a figure which can with some interest be compared with the Indian average value at the pit's mouth of 5s. 1d.; New Zealand about 11s.; Canada, 10s. 9d., and South Africa 5s. 10d. Over 20,000 people are now employed in the Australian collieries.

Should the steamer be going to Far Eastern ports instead of to Australia, she could coal at Sabang, Penang, or Singapore, where Indian coal competes with that of Japan and Australia. While a certain amount of Welsh is available, but the high price restricts its use principally to warships. Singapore is the principal coaling port of this region, over one million tons of coal, mainly Australian and Japanese, being supplied to steamers there every year. Large stocks of coal are always available at this port. The prices during 1912 ranged from 35s. for Welsh, down to 19s. 6d. per ton for Bengal coal. Should the vessel be destined for a Japanese or Chinese port, she would bunker sufficiently at Singapore to complete her voyage. On the Chinese coast the principal coaling stations are Hong Kong in the South, and Shanghai to the North. At Hong Kong good Chinese coal can be purchased at about 19s. 3d. per ton, but there are several qualities of coal stocked there; and even a small quantity of Welsh, for war vessels. At Shanghai Chinese coal was quoted last year at 4s. per ton less than at Hong Kong, owing to proximity to the source of supply, but several descriptions of coal are obtainable, for besides the Chinese there is Australian, Japanese, and quite a good supply of Welsh.

Steamers trading to the Philippines take, when possible, sufficient coal at Singapore to carry them to their port of destination and back to Singapore or some other coaling port, for prices at Manila rule rather high. It is interesting to note that American coal enters this market, which is due to the expansion of American influence following the change in sovereignty. Last year Japanese coal at Manila was quoted at 21s., Australian 23s. 9d., whilst Pocohontas was still dearer. The contracts state that at Manila there will be no benefit of fall in price, and that five days' notice must be given for quantities up to 200 tons, and ten days' notice for quantities between 200 and 500 tons. Large stocks of coal are not held.

On the Cape of Good Hope route coaling conditions have been somewhat modified since South African coal has been available in fair quality and at cheap rates. Steamers returning from Australia or New Zealand, via the Cape, take in sufficient coal before leaving Australia to carry them to Durban; for as the coal is very much cheaper at Durban, they proceed to that port although it adds somewhat to the distance. Durban is becoming a very important coaling station. There are, too, the important coaling stations off the west coast of Africa, all supplied with English coal, namely Madeira, Las Palmas, and St Vincent.

On the outward route from Europe to South America, steamers bound for ports on the west coast, after coaling at Las Palmas, if necessary, usually take in sufficient coal on the west coast to carry them to Coronel, where inferior native coal is supplied, the price during 1912 being 24s. 6d. per ton. Most of the South American coaling ports, however, both on the east and west coasts, are stocked with Welsh coal, but it should be noted that most of the coasting craft on the Pacific side of America use oil fuel; indeed, were it not for the cheapness of Japanese coal, and the excess of cargo space, the trans-Pacific steamers, too, would almost certainly burn oil instead of coal. On the west coast, the ships going for nitrate or grain cargoes, carry outward a cargo of coal at a low rate of freight, that being the only cargo available. On the east coast, Monte Video imports somewhere about a million tons of Welsh coal annually. Steamers returning to Europe from Australia and New Zealand, via Cape Horn, call at Monte Video, and there take in sufficient coal to carry them to Europe, and fill up with such freight as is offering, usually live cattle or chilled meat. The price of Welsh coal in Monte Video in 1912 was 41s. per ton. At the west coast ports, Valparaiso, Antofagasta, Iquique, and Callao, Welsh, Australian and Pocohontas coal can usually be obtained, but prices rule high, and usually steamers sailing from these ports for Europe or United States east coast ports only take in sufficient coal to carry them to the nearest east coast coaling station. Native South American coal at present available is of but poor quality, and cannot be transported long distances. Hence it is only obtainable at Coronel, the nearest port to the collieries. When the coal resources of South America are better known, and more extensively worked, it may well be that, as was the case with South African coal, a better quality at cheaper rates will be available. Within the next few years, especially if the Panama Canal be a success, great developments may confidently be expected in this part of the world.

BOOK IV

SOME OF THE PORTS AND DOCKS OF THE UNITED KINGDOM

CHAPTER I

WHY DOCKS ARE NECESSARY

THE small sailing craft that carried on the commerce of Western Europe three or four centuries ago, on arriving at a port or in a river, could be quite easily and safely accommodated without providing the elaborate and costly docks that are necessary for shipping to-day. A visit now to one of the small Cornish ports, for instance, shows one how shipping was moored, discharged, repaired and reloaded in the days of old. A rough wharf with a few mooring posts sufficed to give a safe berth to the ordinary sailing craft. But, as has already been described, the craft began to grow both in number and in tonnage. And with larger fleets of ships, capable of making longer voyages, and carrying on a regular commerce in commodities large and small, useful and valuable, many new problems emerged. Foremost among these was the fact that the port in order to be a suitable terminus for ships and a safe emporium for valuable cargoes, must be developed on modern lines, and contain much that would have been of but slight utility to the commerce of ancient times. In the first place the ship had grown in dimensions and in value. This more valuable and larger vessel might easily be injured by strain or damage, if not carefully safeguarded when in port, and with perhaps but a modicum of her crew on board. The smaller craft could without injury lie on the mud at low water, and float again as the tide rose. But the larger vessel could only be allowed to do this at great risk. The conditions, too, at different ports vary. At some, the rise and fall of the tide is but slight, so that if there be a well-planned quay, constructed in a situation protected from flood and storm, a ship may be moored there in perfect safety, even though only one man be left in charge. But at other ports the rise and fall of the tide may be more or less considerable, and this may necessitate the construction of locked docks where ships may be water borne at all states of the tide.

Moreover, the ship is not the only consideration. She is the vehicle which carries more or less valuable cargo. These cargoes, both those imported and those exported, are collected at a port either for shipment or for distribution. And during the time they are at the port they are liable to many risks, fire, theft, and in some cases water damage, only to mention some of the risks that have to be faced by the owners of goods subject to ocean transport.

If both ship and cargo be considered together, it becomes evident that some very special provision must be made against the various risks incidental to the conditions of international trade. The shipping community has solved this problem for itself by developing two methods for safeguarding its interests—the wharf and the dock. In the port of London, for instance, both these methods may be observed. Along the banks of the Thames there are no less than three hundred and twenty wharves, having a length of quay accommodation measuring fifteen miles. These wharves were valued by a witness before the Royal Commission on the Port of London (1902) at £13,000,000. Vessels can be moored alongside a wharf and their cargoes can be discharged directly into the safekeeping of the wharfinger. Only comparatively small vessels, however, can be accommodated at the wharves along the banks of the Thames, because of the very considerable rise and fall of the tide. London, however, has also docks covering a land and water area of nearly 3000 acres, and having no less than thirty miles of quays. In some of the docks vessels of the largest dimensions can be accommodated with perfect safety at any state of the tide, and in defiance of climatic conditions, because the dock entrances are furnished with double, and in some cases triple, sets of locks whereby the full depth of water is retained at all states of the tide.

Some ports do not need locked docks because the rise and fall of the tide is small, thus considerable expense both in construction and maintenance is saved. All that is necessary in such a case is a tidal dock, that is a safe harbour where there is perfect security for all vessels that take advantage of the accommodation provided. The dock is self-contained, walled and policed, hence both ship and cargo are rendered safe. The docks at Glasgow and Hamburg are types of this system. Locked docks are necessitated if the rise and fall of the tide exceeds about twelve feet. At London the range of the tide is about twenty feet, at Liverpool and Bristol about half as much again. But at Glasgow even at spring tides the range is only about ten feet. At the ports on the east coast of North America locked docks are not necessary, the rise and fall of the tide being only about nine feet at Boston, and as little as two feet at Baltimore.

In these days when carefully trained police are a guarantee of public security, it is not easy to realise what traders at one time suffered at the hands of thieves of various descriptions. The shipping and cargoes, both inward and outward, in an area like that of the port of London, before the Marine Police system was organised in the year 1798, suffered more than the ordinary percentage of loss through plunder, owing to the almost unrestricted activities of river pirates, night plunderers, light and heavy horsemen, game watermen and lightermen, mudlarks and scuffle hunters, copemen or receivers of stolen commercial property, and many other fraternities of evildoers who battened on the shipping and commerce of the Thames. It has been estimated that at the end of the eighteenth century London merchants lost by plunder on the river no less than £500,000 a year. This was too great a loss to be borne without an effort being made to mitigate it.

The West India merchants are said to have suffered about one half of this loss, the thefts taking place not only in the river, but even from warehouses. It was this that led to the construction of the West India Docks, which were opened by William Pitt, then Prime Minister, in the year 1802. These docks are on the one hand locked docks, which insures the security of the ships, and on the other hand they are well furnished with warehouses for the storage of all kinds of goods, and are so carefully protected by walls with a ditch running along outside, and heavy gates with gatehouses, that from the date of their opening robbery was rendered very difficult. Soldiers were originally stationed at these docks ; and even to-day there can be seen within the main entrance, two of the old guard houses. There were eight sentries posted round the premises, each sentry box having a bell which the soldier on duty had to sound at intervals. In addition to the soldiery, the Dock Company were empowered to organise their own police force.

Some instances of the audacity of the river pirates will show to what lengths their evil practices were carried. "(River pirates [1]) were generally composed of the most desperate and depraved characters, who followed aquatic pursuits. Their attention was principally directed to ships, vessels, and craft in the night, which appeared to be unprotected ; and well authenticated instances of their audacity

[1] *A Treatise of the Police of the Metropolis*, by P. Colquhoun, LL.D., 1806, p. 218.

are recounted, which strongly prove the necessity of a vigorous and energetic Police. Among many other nefarious exploits performed by these miscreants, the following may suffice to show to what extent their daring and impudent conduct carried them.

"An American vessel lying at East-lane Tier was boarded in the night, while Captain and crew were asleep, by a gang of River Pirates, who actually weighed the ship's anchor, and hoisted it into their boat with a complete new cable, with which they got clear off. The Captain hearing a noise, came up on deck at the moment the villains had secured their booty, with which they actually rowed away in his presence, impudently telling him they had taken away his cable and anchor, and bidding him good-morning. Their resources afforded them means of immediate concealment. No Police then existed upon the river, and his property was never recovered.

"A similar instance of atrocity occurred about the same time where the bower anchor of a vessel from Guernsey was weighed and, with the cable, plundered and carried off in the same manner.

"Although only these two instances of extraordinary audacity are specified, others equally bold and daring could be adduced if the limits of this work would admit of it. When vessels first arrive in the river, particularly those from the West Indies, they are generally very much lumbered. Ships in this situation were considered the harvest of the River Pirates, with whom it was a general practice to cut away bags of Cotton, Cordage, Spars, Oars and other articles from the quarter of the vessels, and to get clear off, even in the day-time as well as in the night. Before a Police existed upon the river, all classes of aquatic labourers having been themselves more or less implicated in the same species of criminality, generally connived at the delinquency of each other, and hence it followed, that few or none were detected while afloat and the evils became so extensive."

"(Night Plunderers [1]) were composed chiefly of the most depraved class of watermen, who associated together in gangs of four or five in number; for the purpose of committing depredations on the cargoes of lighters and other craft employed in conveying goods to the quays and wharfs. Their practice was to associate themselves with one or more of the watchmen who were employed to guard these lighters while cargoes were on board, and by the connivance of these faithless guardians of the night, to convey away in lug boats every portable article of merchandize, to which, through this medium, they often had too easy access.

"These corrupt watchmen did not always permit the lighters under their own charge to be pillaged. Their general practice was to point out to the leader of the gang those lighters that were without any guard, and lay near their own, and which on this account might be easily plundered. An hour was fixed on for effecting the object in view. The

[1] *A Treatise of the Police of the Metropolis*, p. 220.

Receiver (generally a man of some property) was applied to, to be in readiness a certain hour before daylight to warehouse the goods. A lug boat was seized on for the purpose. These articles were removed into it out of the lighter, and conveyed to a landing place nearest the warehouse of deposit. The watchmen in the streets leading to this warehouse were bribed to connive at the villainy, often under pretence that it was a smuggling transaction, and thus the object was effected."

"In many instances where goods could not be plundered through the connivance of watchmen, it was no uncommon thing to cut lighters adrift, and to follow them to a situation calculated to elude discovery where the pillage commenced. In this manner have whole lighter loads even of coals been discharged at obscure landing places upon the river, and carted away during the night."

"(Light-Horsemen,[1] or nightly plunderers of West India ships,) for a long period had carried on their nefarious practices with impunity, and to an extent in point of value that almost exceeds credibility, by which the West India planters and merchants sustained very serious and extensive losses.

"The practice seems to have originated in a connection which was formed between the Mates of West India ships and the criminal Receivers, residing near the river, who were accustomed to assail them under the pretence of purchasing what is called

[1] *A Treatise of the Police of the Metropolis*, p. 223.

Sweepings, or in other words, the spillings or drainings of sugars, which remained in the hold and between the decks after the cargo was discharged. These sweepings were claimed as a perquisite by a certain proportion of the Mates, contrary to the repeated and express rules established by the Committee of Merchants, who early saw the evils to which such indulgences would lead, and in vain attempted to prevent it. The connivance, however, of the revenue officers became necessary to get these sweepings on shore, and the quantity of spillings were gradually increased year after year by fraudulent means, for the purpose of satisfying the rapacity of all whose assistance and collusion was found necessary to obtain the object in view.

"The connection thus formed, and the necessary facilities obtained, from the sale of sweepings, recourse was at length had to the disposal of as much of the cargo as could be obtained by a licence to nightly plunderers, composed of Receivers, Coopers, Watermen, and Aquatic Labourers, who having made a previous agreement with the Mate and Revenue Officers, were permitted on paying from thirty to fifty guineas, to come on board in the night,—to open as many hogsheads of sugar as were accessible,—and to plunder without control. For this purpose, a certain number of bags dyed black, which went under the appellation of Black Strap, were provided. The Receivers, Coopers, Watermen, and Lumpers went on board at the appointed time, for all these classes were necessary. The hogsheads articles, pillaged by the Lumpers and others in the progress of the delivery of the cargo, by which they acquired a considerable booty, as they generally on such occasions were employed to dispose of the stolen articles, on pretence of their being a part of the private adventures of the crew, for which service they usually pocketed one moiety of the price obtained. It was by such assistance that Mates, Boatswains, Carpenters, Seamen, and Ship Boys have been seduced, and even taught to become plunderers and thieves, who would otherwise have remained honest and faithful to the trust reposed in them. Many of the watermen of this class were accustomed to live in a style of expense by no means warranted from the fair earnings of honest industry in the line of their profession. An instance has been known of an apprentice lad in this line having kept both a mistress and a riding horse out of the profits of his delinquency."

"A Canada merchant, who had been accustomed to ship quantities of oil annually to the London market, finding (as indeed almost every merchant experiences) a constant and uniform deficiency in the quantity landed, greatly exceeding what could arise from common leakage, which his correspondents were quite unable to explain, having occasion to visit London, was resolved to see his cargo landed with his own eyes, so as, if possible, to develop a mystery heretofore inexplicable, and by which he had regularly lost a considerable sum for several years. Determined therefore to look sharp after his property, he was in attendance at the wharf in anxious expectation of a lighter which had been laden with his oil on the preceding day; and which, for reasons that he could not comprehend, did not get up for many hours after the usual time.

"On her arrival at the wharf, the proprietor was confounded to find the whole of his casks stowed in the lighter with their bungs downward. Being convinced that this was the effect of design, he began now to discover one of the causes at least, of the great losses he had sustained; he therefore attended the discharge of the lighter until the whole of the casks were removed, when he perceived a great quantity of oil leaked out, and in the hold of the vessel, which the Lightermen had the effrontery to insist was their perquisite. The proprietor ordered casks to be brought, and filled no less than nine of them with the oil that had thus leaked out. He then ordered the ceiling of the lighter to be pulled up, and found between her timbers as much as filled five casks more; thus recovering from a single lighter load of his property, no less than fourteen casks of oil, that, but for his attendance, would have been appropriated to the use of the Lightermen; who, after attempting to rob him of so valuable a property, complained very bitterly of his ill-usage in taking it from them."

"Scuffle hunters[1] are so denominated probably from their resorting in numbers to the quays and wharfs where goods are discharging, under pretence

[1] *Cf. A Treatise of the Police of the Metropolis*, p. 233.

of finding employment as labourers upon the landing places, and in the warehouses, and from the circumstance of disputes and scuffles arising about who should secure most plunder from broken packages. This class of men, who may fairly be considered as the very scum of society, frequently prowl about with long aprons, not so much with a view to obtaining employment, as for the purpose of availing themselves of the confusion which the crowded state of the quays often exhibits, and the opportunity of obtaining plunder, in which object they have too frequently been successful, particularly when admitted into the warehouses as labourers, where they have found means to pilfer and carry away considerable quantities of sugar and other articles, in which they were not a little countenanced by similar offences committed by journeymen, coopers and others, who, under the colour of sanctioned perquisites, abstract considerable quantities of sugar, thereby subjecting the proprietors to an accumulated loss; for, in addition to the first cost and price of the article, the duties which have been paid form no inconsiderable part of the ultimate value.

"(Copemen [1] or Receivers of stolen commercial property) may be considered as the chief movers and supporters of the extensive scene of iniquity which has been developed and explained in the preceding pages of this chapter. They were heretofore extremely numerous, and divided into various classes.

[1] *A Treatise of the Police of the Metropolis*, p. 235.

Those denominated *Copemen* formed the junto of wholesale dealers, who were accustomed to visit ships on their arrival, for the purpose of entering into contract with such Revenue Officers or Mates as they had formerly known or dealt with, and such others as they could by means of friendly officers seduce to their views. . . .

"It was their custom to afford assistance wherever such articles were to be procured, by providing Black Straps (*i.e.* the long black bags already mentioned) to contain sugar, and calculated to stow easily in the bottom of boats without being discovered on account of the colour. They also procured bladders with wooden nozzles for the purpose of containing rum, brandy, geneva, and other liquors, and furnished boats to convey the plunder from the ships during the night."

These somewhat lengthy extracts are of interest, and prove that the plundering of ships lying in the river had been reduced to an art, the watchmen and even the mates of the ships frequently being in league with an organised gang of robbers who would carry off their spoils, sometimes even in broad daylight, with impunity. If this state of affairs was the case in the River at London, the seat of Government, it may readily be imagined what the conditions were elsewhere. The outports were even less protected, and thus the shipping community, at the moment when trade was becoming world wide and showing very considerable signs of development, was severely handicapped, until the energy of the trading community successfully grappled with the evil.

Dock dues are frequently looked upon by shipowners as a heavy tax on their business, but they bear no proportion to the losses that occurred before docks were constructed so as to give security against organised robbery.

With growing trade and larger ships the conception of what a port should be, developed. Some of the ports of the United Kingdom had been visited by shipping from the days of remotest antiquity. To assist ships entering and leaving harbour an archaic phare might have been erected, and if the entrance was dangerous, a system of pilotage would gradually evolve. But modern commerce engendered greater needs, and demanded more efficient services. Ships must be brought as near as possible to the emporium or trading town; and as the dimensions increased, the problem of deepening and straightening channels arose. The old fire basket that had served as a phare had to be replaced by an efficient lighthouse, and not only the entrance to a harbour, but the channels leading to it, had to be buoyed and lighted. Eventually points along the whole coast, where shipping passed, were marked and lighted on a consistent scheme, so that the mariner could, by means of the lights, pick up his position as clearly by night as by day. But coast lighting became a bigger thing than could be supervised by a harbour authority, and, as has already been described, is now practically the concern of the central Government.

By these means safe ingress and egress were assured to harbours, but there was an equally important problem to solve. Ships not only enter and leave harbours, but they stay there sometimes for days or even for weeks at a time. Whilst remaining in port a ship being liable to damage, and as time went on and ships increased in value, this liability tending to increase very greatly, some authority had to be responsible for the safety of ship and cargo; and thus the port had to include docks and wharves. From small beginnings, these too developed, until of recent years the demands made upon dock authorities have assumed very different dimensions from what they were fifty or a hundred years ago, necessitating in the case of a large port a very complete staff of highly trained officials, as well as a suitable labour force to cope with the work, which includes not only docking, discharging and loading vessels, but facilities in the shape of dry docks for purposes of overhaul and repair. Now, these entail tram and very complete railway facilities, lighting, pumping, dredging, towage, and a hundred and one other services in a very highly developed form.

In early days small, separate authorities might, without inconvenience, and perhaps quite suitably, attend to the embryonic working of the various spheres here indicated. But with the great extension of modern commerce and the very considerable amount of capital at stake, speedy despatch and the saving of every available hour, have become of greater and greater moment to the shipping community. Hence it has become necessary to concentrate the management and supervision of all the essentials of a port in the hands of one Authority. Nowhere is this more strongly demonstrated than in the case of London, where up till a few years ago there existed a multitude of authorities, one charged with this duty, another with that. There was over-lapping and waste of energy resulting in an uneconomic state of affairs which threatened to strangle the world's greatest port. Happily a means was found to end this state of chaos, and London to-day represents the modern conception of what a Port and its Authority should be.

The values of the total imports and exports (excluding coastwise goods) of the United Kingdom,[1] and six leading ports for the year ended 31st December, were as follows :—

	1912	1911	1910
	£	£	£
United Kingdom .	1,343,601,761	1,237,035,959	1,212,402,841
London . .	383,629,052	368,202,536	360,390,903
Liverpool . .	373,365,515	336,439,017	340,670,089
Hull . . .	80,346,407	71,453,077	73,234,653
Manchester (including Runcorn) .	56,717,969	54,143,473	47,434,206
Southampton .	52,110,062	47,216,924	45,825,337
Glasgow . .	50,785,181	47,135,993	44,094,122

[1] *Cf. Statistical Abstract for the United Kingdom*, Cd. 7022, 1913, Table No. 36.

CHAPTER II

THE PORT OF LONDON

"The fact that London [1] is a port traversed by a long and sheltered tidal river, and conveniently situated for trading with the various coasts of this country, with the Continent, and with other parts of the world, has, no doubt, largely contributed to its rise to the position of the greatest city in England, and so to that of the central city of the British Empire. The Thames is not, like some rivers of greater length and volume, subject to excessive floods, nor is it, like the Elbe and others, often blocked or troubled with ice. There is not, as in many ports, any well marked bar across the mouth of the river, and the natural scour is almost sufficient to maintain the depth of channels. Some of the channels, it is true, of the outer estuary, that is, of the river below Shoeburyness and the Nore, vary from time to time in position and depth from the operation of gales upon sandbanks and other natural causes, but it was pointed out to us by a witness of authority that so great are the natural advantages of the river that little has been done, except some

[1] *Cf. Commission Report of the Royal Commission Port of London*, 1902, p. 13.

desultory dredging, to improve its condition, since those almost prehistoric times when it was originally embanked. The evidence leaves no doubt in our minds that far greater works than desultory dredging are now needed, but this is due only in a slight degree, if at all, to any positive deterioration in the river channels. The new necessities are due in the main to the revolution brought about by the rapid growth in the size and draught of ocean-going ships, and to the demand for rapid despatch."

It is thus that the Royal Commission on the Port of London commences the report that they published in the year 1902. That Commission has had the important consequence of completely modernising the management of the River Thames, and one Authority is now responsible for the river, and all that concerns shipping, with the exception of the riverside wharves and some small private docks, from Teddington Lock to the sea.

From the earliest days the Thames has attracted seafarers. The position of London was doubtless fixed upon as the point, on a very convenient navigable river, at which the ships and boats of long ago could safely congregate. When once the town became permanent and its trade began to develop, the visits of ships in increasing numbers led to the gradual formation of a port with safe moorings in mid stream, and wharf and harbour accommodation on the banks of the river and its tributary streams. It is unnecessary here to enter into a history of the growth of London as a shipping port. But for at least the past two centuries it has been one of the greatest and most important shipping and commercial centres in the world, and the chief port of the United Kingdom both in the amount of shipping tonnage and quantity and value of goods which enter the port. Statistics show that the shipping trade of London has constantly increased. At one time the growth was more rapid than it has been of recent years, but the development still continues to be substantial; nor are the reasons for the slackening of the pace difficult to discover. At one time certain privileged trade centres developed amazingly, while other towns and countries barely held their own in trade. This was due to many causes, both commercial and political. For the past half century, however, the growth of trade and the progress of commerce have been proceeding, on the whole, along healthier lines. The one great emporium threatened with a congestion with which it might be difficult to cope, while still, owing to its position and population, remaining a great and important centre, no longer enjoys a virtual monopoly. There has been a decentralisation of world trade, at once interesting to notice, and of great advantage to the world as a whole. There has been an averaging out of the increase of business, so that while the great trading towns, like London, have not suffered any loss, other towns have either sprung into existence, or there has been an awakening of the older and smaller centres. Not only have the English ports been absorbing part of the trade that used to be almost a monopoly of London, but many continental sea and river ports have also been developing at an astonishing rate. Antwerp, Rotterdam, Hamburg and other ports are now great and progressive distributing centres. It is this phenomenon that accounts for the more sluggish pace of the growth of London as a shipping port. From 1859 to 1879 the percentage of increase in the trade of London was very high. The total net tonnage[1] of shipping entered and cleared with cargo, in the foreign trade only, showed an increase during the decade from 1859 to 1869 of 39 per cent., from 1869 to 1879 of 43 per cent., from 1879 to 1889 of 37 per cent., but from 1889 to 1899 the rate of increase fell to 26 per cent., and from 1899 to 1909[2] it was only about 22 per cent. During the last decade of the nineteenth century whilst the tonnage of shipping entered at London[3] increased 17 per cent., the increase registered at Liverpool was 13 per cent., at Glasgow 23 per cent., at Hull 23 per cent., at Southampton 67 per cent., at Bristol 26 per cent, at Hamburg 49 per cent., at Rotterdam 116 per cent., at Antwerp 51 per cent., at Havre 2 per cent., at Marseilles 31 per cent., at Genoa 34 per cent., and at Trieste 48 per cent. The report in explanation of these figures says[4]—

"The obvious indication of these figures is that

[1] *Cf. Report on Port of London*, p. 17

[2] This percentage is taken from the Statistical Abstract, rather different figures which include vessels in ballast, but is substantially correct for the purpose of comparison.

[3] *Cf. Report on Port of London*, pp. 18, 19.

[4] *Cf. Ibid.*, p. 20.

in recent years the percentage of increase has been much greater at a port like Southampton and at certain Continental ports such as Hamburg, Rotterdam, and Antwerp, than it has been at older ports, such as London, Liverpool and Hull in this country, or at Havre, Marseilles, and Genoa on the Continent, all of which were more conspicuous at an early date than the ports which have lately been developing so rapidly. The explanation would appear to be that to some extent the ports in question are calling ports, especially ports like Southampton, Rotterdam and Antwerp, and that their business as a whole does not properly enter into comparison with that of a port which is chiefly one of ultimate destination like London and Liverpool. We are unable to conclude therefore, that the figures show any relative decline of London compared with the other ports named, allowing for the difference in the nature of the business done. This view is further strengthened when we allow for such obvious explanations as the larger percentage of the increase in a case when the initial figure is small than in a case when it is large, although the amount of increase is the same in both, and for the fact that a large part of the trade of Hamburg, Rotterdam and Antwerp is with the ports of the United Kingdom, and even with London. What the future development will be is not easy to foresee. Southampton, Hamburg, Rotterdam and Antwerp have all gained largely in the shipping returns in recent years by the establishment of lines of steamers, many of these with subsidies, just as

London and older ports gained at an earlier date, but there is nothing to indicate that the older ports are being superseded, or prevented from largely increasing. The development of Hamburg, in particular, it should be added, cannot be unconnected with the increasing dependence of Germany, as its population increases, on supplies of food and raw material imported from abroad, and especially from oversea, Hamburg being the chief inlet of the whole Empire."

The point in the latter part of this quotation should be emphasised. There is nothing to indicate that the older ports are being superseded, the rapidly developing world-trade is more widespread, new centres are being developed, and from comparatively small beginnings, their percentages of increase rank high. But it should be noted that they are *percentages*, and that in most cases the old ports hold their own in the amount of the increase, whilst their *totals* are very considerably greater than those of their younger rivals.

Turning more particularly to London, it will be necessary in order to understand the present position and management of the port to trace out its history and development during the nineteenth century. Until the end of the eighteenth century there were no *wet docks* in London, with the exception of one on the south side of the river, which is now included in the Surrey Commercial Docks. The usual practice was for ships to be loaded or discharged in the river, or at wharves. Trade was not continuous as it tends to be now, but *seasonal.* Hence during the busy season, the stream was crowded with ships at their moorings, and movements of craft were attended with difficulty and danger. It should be noted, too, that by regulations dating from Tudor times goods could only be landed at certain *legal quays*, or under special permit at *sufferance wharves.* Both these became utterly inadequate for the needs of trade, and thus a growing quantity of goods had to be discharged into barges, and in the busy season it might be impossible to discharge these craft for weeks, as they had to await their turn at the quays. The growth of business and the unprotected state of the river, already referred to, led the West India Merchants to apply to Parliament for a charter authorising them to construct a special dock for West Indian imports and exports. In order that their expenditure should be remunerative, they asked for and obtained a monopoly of the trade. The Act of 1799, which constituted the West India Dock Company, required them to construct wet docks, quays and sufficient warehouses, defended by a high wall and a ditch, and provided that the quays should be *legal quays*, and that for a period of twenty-one years all ships loading for or discharging from the West Indies should come to their dock. The West India Docks were opened for business in the year 1802. Realising what the success of this dock would mean, other groups of merchants, in order to safeguard their interests, began to apply to Parliament for powers to construct docks. The wine, brandy, rice and tobacco merchants obtained a charter in the year 1800, which resulted in the opening of the London Docks in the year 1805. This company, too, obtained a monopoly in the trades mentioned for twenty-one years, except over ships coming from the West Indies. Two years before the London Docks were opened, the East India Dock Company was formed by the India and China merchants, and Parliament in their charter granted them the same monopoly of twenty-one years over all ships from the East Indies and China. These charters all contained special clauses as to buildings, yearly dividends (which were limited to a maximum of 10 per cent.) and the rates that might be charged for accommodating both ships and goods. There was another provision in these charters which has been of the very greatest moment; indeed[1] it was averred to be the cause of the breakdown of the old Dock Companies, which has necessitated the recent constitution of the Port of London Authority. The monopolies granted to the new Dock Companies seriously affected the vested interests of watermen and lightermen. Thus not only were these men compensated by a money payment, but a clause was inserted in the Dock Charters, granting to all barges and lighters in perpetuity the right of entering the docks free, and of delivering or receiving any amount of cargo free of charge. This may have been a just and generous policy during the period when the Dock Companies were enjoying their monopolies,

[1] *Cf. Report of Royal Commission*, p. 284 ¶ 5581.

but the monopolies came to an end, and were not renewed, yet the barges throughout the history of the old Dock Companies continued to enjoy freedom from charges. Nor has the privilege been either minimised or withdrawn by the Act constituting the Port Authority, for "All lighters and craft entering into the Docks, Basins, Locks, or Cuts to discharge or receive ballast or goods to or from on board of any Ship or Vessel LYING THEREIN are exempt from the payment of any rates SO LONG AS such lighters or craft are *bonâ fide* engaged in so discharging or receiving the ballast or goods." [1]

Not only were docks constructed, but an effort was made to improve the river by the Corporation of the City of London constructing the City Canal across the Isle of Dogs, by means of which the necessity for going round one of the bends in the river was obviated. This canal was subsequently enlarged and became the South West India Dock. By the end of the year 1806, these several improvements for the accommodation of shipping in the Thames were completed. Meanwhile the Warehousing Act had been passed (1803). This Act should be noticed because by it commenced the system of bonded warehouses by means of which dutiable goods could be stored *in bond*, and the duty need only be paid when the goods were needed for consumption. In practice, for many years the system was restricted exclusively to London, and to the warehouses of these new docks. As may be readily

[1] *Cf.* Port of London Authority, *Rates on Shipping*, p. 13.

imagined, the exclusive possession of this convenient system gave the Dock Companies a very considerable advantage over any possible competitors.

In the year 1823 the first of the monopolies, that of the West India Dock Company, terminated, and Parliament, following the economic bent of the time towards free competition, refused to renew it. The other docks within a few years also lost their monopolies, and Parliament going a step further, in the year 1832 extended the Bonded Warehouse system. By this legislation the Commissioners of Customs were given extended powers, and nearly all the regulations and restrictions as to *legal quays* were abolished. Twenty-one years later the Commissioners of Customs, under the Customs Consolidation Act, obtained still wider discretion, for they were empowered to license bonded warehouses and sufferance wharves. Thus the Dock Companies not only lost their monopolies, but in addition, their privileges as exclusive owners of bonded warehouses. This new policy of freedom led to extended construction of docks on the Thames. In the year 1825 the St Katherine's Dock Company was constituted, but Parliament not only gave it no monopoly, but inserted in its Act the clause exempting barges and lighters from paying dock dues. The St Katherine's Docks were constructed on a site close to the City. It had been suggested that the moat surrounding the Tower of London should be enlarged and utilised as a dock—happily this suggestion was not carried out; but the Hospital of St Katherine's near the Tower was removed to Regent's Park, and its old site cleared and excavated as a dock. The warehouses adjoining the dock were among the finest and most substantially constructed warehouses in London. It is of interest to notice that the St Katherine's Docks were built nearer to London than the older docks, the theory of the projectors being that goods should be carried as near the town as possible, and so save transhipment and handling. This policy, which in more recent years has led to the construction of the Manchester Ship Canal and Docks, was reversed in the case of London—all docks constructed, since the St Katherine's, have been situated further down the river, until at Tilbury the distance from London is about twenty miles.

The expansion of the dock system of London until it reached its present dimensions can be quite shortly described. In 1829 the West India Dock Company purchased the City Canal from the Corporation of London, and in 1838 the East and West India Dock Companies amalgamated.

In the year 1835 the dock accommodation on the Thames was further increased by the construction of the Victoria Dock, on a site situated further down the river, on the north side, between Blackwall and North Woolwich. This dock, however, for many years was rather a pond than a dock, there being but little attempt made to equip it with facilities for handling cargo or mooring vessels. But in the year 1864 a new departure was made by the amalgamation of the London and St Katherine's Docks;

and Parliament, in the Act effecting this, permitted the new Company to purchase the Victoria Dock. Eleven years later this Company obtained Parliamentary sanction to construct the Royal Albert Dock, adjoining the Victoria Dock, but still further eastward; and with the construction of the Albert Dock the system of the old London Dock Company was completed.

There had been a great deal of competition between the rival Dock Companies, and this series of amalgamations, practically left the two great Companies facing one another in competition for the main trade of the port. For the other companies, the Surrey Commercial and the Millwall, as will be seen, were for the most part engaged in the soft wood and American grain trades.

The action of the London Dock Company in constructing fine deep water docks further down the river, was calculated to have the effect of accommodating all the large steamers entering the Thames. And it was by that time obvious that the large steamer was going to do the work of the world before many years passed. Hence the East and West India Dock Company, in order to retain their position and prestige, determined to make a bold bid for the custom of the large steamship companies. In the year 1870 they had enlarged and deepened the old City Canal, which, under the new name of the South West India Dock, added some very useful accommodation to the port; and a little later on had improved the East India Dock by the construction of a fine basin at Blackwall, which became the home of the Castle Line to South Africa. Then, after hesitating for some time between Dagenham and Tilbury, they decided to construct docks at Tilbury.

The finest warehouses yet built in London were to be an accompaniment to the scheme, and it was decided that these warehouses should be as near the City as possible—the site selected being within a few hundred yards of Leadenhall Street. To bring the goods from Tilbury to the London warehouses special barges were constructed by an independent Company, and special transport rates were arranged. This scheme passed through Parliament successfully, and the Tilbury Docks were opened in the year 1886. But these great efforts on the part of the rival dock companies, which provided accommodation beyond the needs of the port at that time, had strained the resources of both very severely. After a short period of reckless competition, an amalgamation was effected in the year 1888—but this came too late. The rivals had lost the confidence of the investing public, and dock stock which had for so long been considered as good a security, and a better paying investment, than Consols, went down to about a fifth of its nominal value.

On the south side of the river there had been docks for nearly two centuries. At Rotherhithe a dry dock had been constructed in the year 1696, and a wet dock was opened in 1700. In the year 1720 the dock was leased to the South Sea Company for their whaling ships, and the name of the Greenland Dock commemorates to this day the industry which had its terminus in these docks.

In the year 1807 the Commercial Dock Company was formed, and besides acquiring the two existing wet docks, constructed further accommodation, including both docks and warehouses. These docks, being less than two miles from London Bridge, were conveniently situated for certain trades. Six years before this new Company had come into existence, the Surrey Canal Company had been incorporated. The object of this Company was to construct a canal from Rotherhithe to Mitcham, in Surrey, and by means of branches, join up various parts of Kent and Surrey with the Metropolis, nor did this exhaust the ambitions of the Company, for it was hoped that the canal system might at length reach Portsmouth. The coming of the railway, however, curtailed this great plan, for the canal was never carried beyond Camberwell and Peckham. At the junction of the canal with the Thames there was a basin and ship lock. In the year 1855 Parliament consolidated the various Acts affecting the Company which was renamed the Grand Surrey Docks and Canal Company. This Act empowered the Company to raise further capital for the construction of additional docks and premises. A new dock covering 16 acres, with a basin of 3 acres, about 250 feet long by 50 feet wide, with a depth of 27 feet, giving access to the river, was opened in 1860. Four years later the whole of the adjoining docks belonging to these two companies were amalgamated under the name of the

Surrey Commercial Dock Company. The Act authorising this amalgamation allowed the new Company to raise additional capital in order to make further additions to its dock and warehouse properties. In consequence of this the total area of the united Companies amounted to 370 acres, of which 102 acres were deep water, and 63 acres were shallow water. This same company in the year 1876 opened the new Canada Dock covering nearly 16 acres of water. The new Greenland Dock, having a water area of nearly 23 acres, was opened as recently as the year 1904. This dock has an entrance 80 feet wide, with a depth of over 35 feet.

The Millwall Dock Company was incorporated in the year 1864 by the Millwall Canal Wharf Graving Docks Act. These Docks are on the Isle of Dogs, and adjoin the South West India Dock. The total area of the property owned by the Company was 234 acres, of which about 36 acres was under water. There is a single entrance lock 450 feet long.

In addition to what may be termed public docks, there are the Brentford Dock, the Chelsea Dock, the Poplar Dock, and the Deptford Dock belonging to railway companies. But all these small docks, together with the Regent's Canal Dock, are rather "riverside terminal stations." They do a considerable business in small craft, but have not been included in the Docks under the Port Authority.

Thus at present the facilities offered by the Port of London to shipping consist of :—

I. The riverside wharves: these begin on the north side of the river as far up as Blackfriars Bridge, and on the south side even higher up there is Nine Elms, which is situated just above Vauxhall Bridge. The wharves on the river, at which goods brought into the river can be landed, are *legal* and *sufferance* or *approved wharves*. Legal quays date from the reign of Queen Elizabeth, when it was enacted that all goods entering the river must be landed at legal quays. With increasing trade further accommodation was from time to time required. Thus at the time that the policy of constructing docks commenced, there were both legal and sufferance quays where all seaborne goods had to be landed. The sufferance wharves are now divided into three classes. Class A, which has the privilege of landing dutiable goods, and perhaps of warehousing them if there is a warehouse on the spot. The wharves in this class are situated in the upper parts of the river, between London Bridge and Wapping. Class B have the privilege of landing free goods, or of landing free goods with certain exceptions. Class C have the privilege of landing particular kinds of goods. The privileges have been conferred from time to time by the Board of Customs according to the demands of wharfingers and the necessities of trade. If any one wants to have a wharf approved it is necessary to show the Board of Customs that there is a reasonable promise of sufficient business being done at that place to make it worth the while of the Board of Customs to station officers there to examine the goods.

II. The Upper Pool, commencing at London Bridge, where vessels lie moored in midstream. These vessels are mainly medium-sized and small craft employed in the home and continental trades.

III. Certain small docks really terminal stations belonging to railway or canal companies.

IV. The system of deep-water docks under the control of the Port of London Authority. These consist of a series of docks mainly on the north side of the river, extending at intervals from the Tower of London down to Tilbury, a distance by river of 22 nautical miles. On the south side of the river lie the Surrey Commercial Docks, forming one compact system of water basins, extending from the Pool to Limehouse Reach. The Surrey entrance to these docks is just one and a half miles, and the Greenland entrance, three miles below London Bridge. The entire land and water area measures 380 acres (460 acres including the Surrey canal), and the docks all lie within the district of Rotherhithe. These docks are the chief centre of the import timber and grain trades, and in addition there is one of the most progressive of the import trades with London, namely the bacon, cheese, and general produce from Canada which centres there. The extent of these docks will be realised when it is mentioned that the quay accommodation measures six miles in length, and in addition to 124 acres of deep water for shipping, there is nearly 70 acres of ponds for timber floats, capable of containing 50,000 cubic loads of timber. Beside the floating timber there is a land area of 200 acres for piling timber, and there are sheds, covering another fifty acres, capable of storing 78,000 standards of wood that require to be kept under cover. This accommodation houses the largest stock of cut timber in the world. The quantity of timber landed in a single year at these docks varies between twenty-one and thirty-seven million pieces, deals, and rough and prepared boards. In addition to this there are large quantities of hard wood, and various classes of timber. The wood that enters these docks comes mostly from the Baltic, the White Sea, and the eastern and western sides of North America. The grain entering these docks comes for the most part from the Baltic, the Black Sea, and North and South America. The granaries here are excellent and commodious, and the transport facilities for distribution throughout the country have led these trades to concentrate in these docks. The grain is discharged into the granaries either (1) by pneumatic or bucket elevators attached to special band machinery, whence it is distributed to any floor or any part of the warehouse. The elevators have a capacity for lifting, delivering, and weighing 200 tons of grain an hour. Or (2) by porters, a class of men who have attained special skill in handling sacks of grain.

These docks are also equipped with cold storage, so that refrigerating steamers can be accommodated.

The bacon from Scandinavia and America arrives in this country only partially cured, so that it can be finished to suit the English market. There is a large and growing business in perishable goods which have been chilled for the voyage, and are kept in storage at the docks until required for consumption.

The docks on the north side of the river under the Port Authority commence with the St Katharine's Dock, which is situated half a mile below London Bridge. This dock has a land and water area of twenty-three and a half acres, the water area being ten and a half acres. In the days of the China clippers this was the dock where most of the tea cargoes were discharged and warehoused. Now the docks are only suitable for the small steamers engaged in the continental trade, but the warehouses, which are very substantially built, are used for the storage of some of the most valuable commodities which enter the Port of London, for instance, tea, indigo (a commodity of decreasing importance owing to the increasing use of aniline dyes), wool, shells, tortoiseshell, and marble. One warehouse is partially utilised for the manufacture of scent. Southern Europe sends to London extract of flowers mixed with fat. In this warehouse the extract is separated from the fat, and mixed with alcohol to make various perfumes. Being thus manufactured in bond for exportation, there is no need to pay duty on the alcohol consumed. Our fiscal system does not permit the payment of a *drawback* on dutiable goods exported, hence the necessity to keep such goods *in bond*. This fact also affects the wine, spirit, and tobacco industries.

Adjoining the St Katharine Dock are the London Docks, the Wapping entrance being one mile, and the Shadwell entrance one and a half miles, below London Bridge. The land area of these docks is 63 acres, and the water area 38 acres. These docks provide very considerable warehouse accommodation, the floor area measuring over 3,000,000 square feet, and having a capacity for housing about 220,000 tons of goods. The vaults under the warehouses are the centre of the wine industry, and contain space for storing upwards of 100,000 pipes of wine. The extent of the vaults may be realised from the fact that the gangways in the vaults have a total length of over 28 miles. The goods warehoused here include wool, wine, brandy, sugar, india rubber, dried and green fruit, ivory, spices, bark, gums, metals, drugs, dates, pepper, rice, coffee, cocoa, and quicksilver. The quantity of ivory imported into London in the year 1912 was nearly 5700 hundredweights, valued at £360,000. The tusks have to be very carefully examined when received, and weighed, as the natives of the countries of origin have a habit of inserting stones or metal into cavities, in order to make the tusks weigh as much as possible.

About a million and a half bales of wool valued at about £20,000,000 enter the Port of London annually. As a single bale of wool contains the fleeces of about sixty sheep, the requirements of the London market affect nearly 100,000,000 sheep and lambs. The accommodation for wool in the London and St Katharine's Docks alone occupies a warehouse flooring area of 32 acres, and during the wool sales, which take place six times a year, as many as 1200 hands are required to cope with the work.

A mile below the Shadwell entrance to the London Docks is the Limehouse entrance to the West India Docks. The three Docks, known as the West India Import, the West India Export, and the South West India, are each about half a mile long, and together with their basins and entrances connect Limehouse Reach to Blackwall Reach. At Limehouse the Thames bends considerably to the South as far as Greenwich, and then turning North again forms a horse-shoe. Across the open end of the shoe the docks have been constructed, and thus an island, known as the Isle of Dogs, has been formed within the bend. The Blackwall entrance of those docks is 5½ miles below London Bridge. The docks and basins have a water area of 94 acres, and a land area of about 140 acres. The warehouses will accommodate about 195,000 tons of goods, of which the main commodities are rum, sugar, hops, grain, and valuable woods for cabinet-making purposes. There is also a warehouse installed with refrigerating machinery, having a capacity of 380,000 cubit feet, which is capable of housing 90,000 carcases of frozen mutton. The Rum Quay and its vaults are one of the sights of these docks. There is storage accommodation for 40,000 puncheons of rum. The vaults are a good specimen of groined brickwork, the arches being elliptical and springing from octagonal stone piers. A large blending and bottling business is done on the quay, rum for export being bottled in bond, to avoid payment of the duty. To the south of the West India Export Dock is the South West India Dock, which may perhaps be called the last home of the sailing ship, it being there that, as a rule, the few remaining sailing ships discharge and load. There is a graving dock adjoining the Blackwall Basin of these docks—but it is at present leased to a private firm.

Further to the south, and in the centre of the Isle of Dogs, is situated the Millwall Dock. The entrance to this dock is 450 feet long and 80 feet wide, with a depth in the fairway of 28 feet. There is a water area of nearly 37 acres, and just under 200 acres of land. Grain is the principal commodity imported at this dock; on an average about two-fifths of the grain entering the Port of London is discharged here. One of the features of the dock is the central granary, with its thirteen floors, and its elevators. This granary was constructed in the year 1903 to give greater facilities for the discharge and storage of grain cargoes. In addition to the granary, there are floating pneumatic machines for discharging grain; when both sets of machinery are working together they can handle no less than 500 tons of grain an hour. Adjacent to the dock there is a graving dock 550 feet long, which is a great convenience to vessels requiring repairs.

Just below the Blackwall entrance to the West India Docks is the line of the Blackwall Tunnel, thus all the docks so far mentioned are situated above the tunnel. Much as that great engineering work may be admired, it has had the unfortunate effect of blocking the channel to all these upper docks for large vessels. The tunnel was opened to traffic in the year 1897. When it was planned, those responsible for the depth at which the tunnel was to be constructed below the bed of the river, were not sufficiently far-sighted to realise that the day of the small vessel was almost over, and that for the great ocean routes there would be the necessity for ships of ever larger tonnage. Thus it was soon discovered that even the medium-sized steamers of the early 'nineties were liable to be neaped if they happened to be loaded in an up-river dock, and were ready for sea during neap tides. It was a blind policy which possibly may have even more serious effects than have as yet been experienced. While Manchester, to the advantage of the great manufacturing centres of Lancashire, has spent millions in constructing a canal and docks to bring steamers and their cargoes directly to her doors, and so save the cost of extra handling and transhipment; while Glasgow, too, has created a river out of a ditch, and can both build and load large steamers near to the city; London has, perhaps blindly, prevented any such possibility, and has compelled the large steamer to discharge and load from 10 to 20 miles below London Bridge.

The time may come when, the Port Authority having straightened out the tortuous bends of the river, and having dredged a channel sufficiently deep for large steamers to ascend the Thames above Woolwich, it may become practical politics to sacrifice any tunnels that block the way, in order that the improvements to bank and channel may admit of the largest steamers ascending the river to improved docks situated within measurable distance of the City.

The policy of Manchester and Glasgow, and that of London, can hardly both be right. It is true that both the former cities are situated near great manufacturing areas, but that London is also a great manufacturing centre is very apt to be forgotten. The teeming millions of London, too, require an enormous amount of imported foodstuffs. If these foodstuffs have to be discharged at Tilbury and Silvertown, and then there is the extra expense entailed by two or three unnecessary handlings, prices both wholesale and retail must be affected. If at London alone of the great commercial centres it be necessary to employ barge or waggon to overcome the shallowness of the river, whilst elsewhere the big steamer herself is employed to do the work of distribution in order to avoid the expenses incurred by transhipment, then the trade of London must inevitably suffer. For the distributing trade, the present policy may do well enough, but it is not calculated to assist in the maintenance or the development of local industries.

Four and three-quarter miles below London Bridge are the East India Docks, which are important because their entrances are below the sudden bends in the river which commence with Blackwall Point, and because when docks and channel are dredged there will be nothing to prevent deep draft vessels from entering and leaving them. The water area measures about 32 acres, and there is a land area of about 30 acres. The improvements now being carried out should greatly add to the utility of these docks. The site is historic, being connected with the East India Company, and the great shipbuilding yards of Perry, Green and Wigram. Leaving the East India Docks and proceeding down the river, Bow Creek and the Trinity Wharf are passed, and half a mile below the East India Docks begin the Victoria and Albert Docks. For the large steamers entering the River Thames these are the most important docks of the whole system, for no less than one half of the shipping tonnage entering the docks under the Port Authority utilises these docks. The water area, when the present improvements are completed, will consist of 252 acres with a land area of 845 acres: the largest area of any of the docks. The entrance to the Victoria Dock is six and a quarter miles below London Bridge, whilst the entrance of the Albert Dock at Gallions Reach is about three miles further down the river. The warehouses situated in the Victoria Dock are principally used for the storage of grain, tobacco and frozen meat. There are only sheds on the quays in the Albert Dock, for this Dock is used almost entirely for the discharging and loading of steamers; goods that need warehousing are removed from the dock by rail or lighter. There is a very complete system of rails round these docks connecting them with the railway system of the country.

In the tobacco warehouse in the Victoria Dock as much as 20,000 tons of tobacco will be in bond at one time. The warehouses in these docks insulated for the storage of frozen meat, are among the largest in the world, having accommodation for over 800,000 carcasses, the total storage accommodation under the Port Authority being nearly 1,200,000. There are two graving docks adjacent to the Albert Dock, and in the new extension, which is under construction, there will be a third and larger graving dock with a normal length of 650 feet, but capable of being extended to 800 feet, with a width of 100 feet.

Thirteen and a half miles below Gallions Reach is the entrance to the Tilbury Docks, which have a water area including extensions in progress of 90 acres, and a land area of 596 acres. There is a tidal basin connected with a main dock and three branch docks. The depth of water in the docks at high water during spring tides is 38 feet. Very large steamers can thus be accommodated.

There are also two graving docks—the largest in London. They can be used as single or double docks; as single docks they have a length of 850 feet, and could accommodate any of the large vessels now afloat, except the very latest White Star, Cunard, and Hamburg American liners. Each of these big docks contains 12,000,000 gallons of water, but powerful pumps are capable of emptying them in an hour and a quarter. One of the improvements now in progress at Tilbury is the construction of a river-side jetty for the convenience of steamers having part cargo for London. There will be no necessity for these vessels to enter the docks, they will come alongside the jetty at any state of the tide, discharge what cargo there is for London, and leave again without having to wait for the tide.

The equipment at Tilbury is very complete, and the celerity with which goods can be handled is greater than probably at any other port in the world. A thousand bales of wool an hour have been discharged from a steamer without there being apparently any extra pressure on the staff.

It is now possible to take a broad view of the Port of London. Under the recently constituted Authority, the Port commences at Teddington Lock and extends for a distance of about 70 miles, to an imaginary line drawn between Havengore Creek, Essex, to Warden Point in the Isle of Sheppey, Kent. "It includes all islands, rivers, streams, and water-courses between the flow and reflow of the tides, and so much of the River Lea and Bow Creek as is below the Iron Bridge carrying Barking Road over the Lea at Poplar. The river Medway and the Swale are excluded from such jurisdiction."

The principal powers and duties of the Port Authority are :—

(1) The maintenance and improvement of the river channels.

(2) Regulation of the traffic in the Port, the movements and positions of vessels and the manner of discharging and loading them.

(3) The removal of wrecks and obstructions.

(4) The licensing of piers and embankments, stages and cranes, the placing and maintenance of moorings, the provision of landing-places, and the carrying out of the Explosives and Petroleum Acts so far as they affect the river.

(5) The licensing and control of watermen and lightermen, and the registration of river craft and boats.

(6) The prevention of offensive or injurious matter passing into the river and its tributaries within a limit of three miles from the main river, comprising a total area of 292 square miles.

The following works and improvements [1] are in progress to make the Thames more convenient for shipping of growing dimensions :—

From London Bridge to Tower Bridge a channel 450 feet wide and 14 feet deep at low water ;

From Tower Bridge to Thames Tunnel a channel 500 feet wide and 14 feet deep ;

From Thames Tunnel to the Greenland Dock a channel 500 feet wide and 16 feet deep ;

From the Greenland Dock to the Royal Albert Dock a channel 600 feet wide and 20 feet deep ;

[1] *Cf.* Fourth Annual Report, 1913, p. 13.

From the Royal Albert Dock to Crayfordness a channel 600 feet wide and 30 feet deep ;

From Crayfordness to the Nore a channel 1000 feet wide and 30 feet deep.

Progress has been made in the deepening and widening operations.

IMPROVEMENTS AND EXTENSIONS TO THE DOCKS[1]

London Docks.	
Rebuilding of Tobacco Entrance, 60 feet wide and 25 feet 6 inches deep. Ferro-concrete jetty, 782 feet by 190 feet, with double storey transit sheds, in Western Dock. Pumping installation to maintain water level at 4 feet 6 inches above Trinity high water.	£265,584
East India Docks.	
Widening entrance passage between basin and Import Dock to 80 feet by 31 feet deep. Widening North and East Quays by 20 feet. Construction of three transit sheds on North Quay, each 430 feet by 110 feet. Double storey transit shed on East Quay, 400 feet by 50 feet. Pumping plant to maintain water level in docks. Cranes, roads, drains, electric lighting and other equipment.	£181,369
West India Docks.	
Widening North Quay of Import Dock by 55 feet 6 inches. Construction of three double storey transit sheds thereon, each 800 feet by 65 feet. Cranes, roads, drains, electric lighting and other equipment. Widening North Quay of Export Dock by 20 feet. Construction of two transit sheds thereon, each 740 feet by 75 feet. Cranes, roads, drains, electric lighting and other equipment.	£243,753
Carry forward,	£690,706

[1] *Cf.* Third Annual Report, Port of London Authority, p. 8.

Brought forward, £690,706

Royal Albert Dock Extension (South)	
Entrance Lock, 800 feet by 100 feet by 45 feet depth at high water. Dock with area of 65 acres, quayage of 9,885 lineal feet, and depth of 35 feet. Jetties along front of South Quay. Transit sheds 500 feet by 120 feet. Dry dock, 650 feet by 100 feet, with depth of 35 feet on blocks, to be afterwards lengthened as required. Railways, roads, drains, cranes, plant, electric lighting and general equipment.	£1,660,518
Royal Albert Docks, enlargement of Western Dry Dock.	
Enlarging the smaller dry dock from 408 feet by 55 feet to 575 feet by 80 feet.	£47,000
Tilbury Dock.	
Extending South Quay of main dock by 1,612 lineal feet. Three transit sheds, each 600 feet by 120 feet. Railways, roads, drains, cranes, electric lighting and other equipment.	£273,247
Total including 10 per cent. for contingencies	£2,671,471

In consequence of the recommendations of the Royal Commission, and the Act which has constituted this Authority, London is rapidly becoming one of the most up-to-date of our ports in every respect. The Authority, too, are aware of the importance of letting all the world know the facilities both provided and prospective in the docks under their charge. Thus a Commercial Superintendent has been appointed, and during last year he was in Australasia explaining the new state of affairs in London. This is a new departure, and is of the happiest augury for the future of the trade of the river Thames.

CHAPTER III

THE PORT OF LIVERPOOL, AND THE MANCHESTER SHIP CANAL AND DOCKS

THE Port of Liverpool owes its position partly to situation, for it is at a convenient point where the import and export trade of Lancashire can focus, but partly also to the energy and ability of several generations of business men.

Although enjoying a long history its importance as a shipping centre is comparatively modern. When Charles the First made the levy for ship money in the year 1634, while Bristol was assessed at £1000 and Chester at £100, the amount levied on Liverpool was only £15. To-day, Chester, owing to the silting up of the Dee, has ceased to be of any account as a shipping port, but Liverpool has become the second port in the Empire with sixty-five docks, occupying a river frontage of six and a half miles, having a water area of over six hundred acres, and surrounded by over thirty-six miles of quays. There was for a time a certain feeling of rivalry between Liverpool and Chester, indeed Chester claimed a certain amount of control over the trade of her rival. But under the Commonwealth it was decided that these claims were unfounded, and the Restoration Government confirmed this decision.

The total value of goods imported and exported during 1912 was £10,263,537 less than London. But London is a great importing, Liverpool a great exporting, centre. Thus, whilst London during the year 1912 imported goods to the value of £239,344,384, the imports of Liverpool were only £179,250,136. Liverpool, however, is the greatest exporting centre in the Empire, the value of exports, being products of the United Kingdom, during the year 1912 was £163,725,870, those of London being nearly seventy-five and a half million pounds less in amount. But London does a very considerably greater entrepôt and transhipment trade than Liverpool. It must, moreover, be remembered that shipping is vital to Liverpool, which is a port and nothing else. Take away the ships and docks, and but little would remain. With London the shipping industry is but one of many important interests, and there are thousands of Londoners who have never seen the docks, and it is possible that many have never even seen a ship. These two great cities, however, stand out conspicuously as the predominant British ports, the statistics of the next showing a very considerable decrease in values.

As in the case of London, ships lay in the river, the busiest point being the pool, and as the eighteenth century dawned Liverpool merchants decided to develop the pool. Calling to their assistance a qualified engineer, Thomas Steers, it was pointed out by him that a much more satisfactory plan would be to convert the pool into a wet dock by enclosing it, and erecting dock-gates so as to retain the water at all states of the tide. The Corporation accepted this scheme, brought a Bill before Parliament, and in the year 1715 opened a wet dock, which had a water area of four acres. The dock was not really completed until five years later, but with the exception of the docks on the Thames, this was the first wet dock constructed in England.

From that moment the development of the system of docks at Liverpool has been steadily progressive. This original dock no longer exists, its site being occupied by the present Custom House.

It was Liverpool that first taught the world how a great commercial river and port should be managed. While the Port of London drifted along under a system of chaos, the wonder being almost that the Port was able to exist at all, Liverpool had by a series of developments, evolved a model Port Authority under which unity of management and aim resulted in the development of the dock system on a business-like plan, the docks being grouped together and extending seawards as the demand for further accommodation was felt.

The Authority managing the Liverpool Docks has developed through six stages. At first the small accommodation required by the shipping visiting Liverpool was under the control of the Corporation of the town; then in the year 1761 the property in all the Docks, Piers, Buoys, Landmarks, etc., was vested in the Mayor, Aldermen, Bailiffs, and Common Councilmen of Liverpool, who were empowered to bring or defend actions under the name of the *Trustees of the Docks and Harbour of Liverpool.*

In 1811 the management of the docks was delegated to a committee of twenty-one members of the Common Council, who were known as the *Trustees of the Liverpool Docks*: this was a body corporate, having a perpetual succession, and a common seal. Their proceedings were, however, subject to the veto of the Common Council. This lasted until the year 1825, from which date the Common Council only nominated thirteen of the twenty-one members of the Dock Trustees, who were renamed *The Committee for the affairs of the Estate of the Trustees of the Liverpool Docks.* The other eight members were elected by the dock ratepayers, who had hitherto not been represented on the Board. In the year 1851 there was an important change in the constitution of the Trustees. Henceforward twelve members were nominated by the City Council, and twelve were elected by the dock ratepayers. Two years later a Royal Commission was appointed to consider the growing needs of the Port. This recommended that a governing body be constituted to whom the property and dues should be transferred. Thus five years later, in the year 1858, *The Mersey Docks and Harbour Board* was constituted by Act of Parliament, to take over the entire control of the Port. The

Board was to consist of twenty-eight members; twenty-four elected by dock ratepayers, and the remaining four to be appointed by the Mersey Conservancy Commissioners, who are the First Lord of the Admiralty, the Chancellor of the Duchy of Lancaster, and the President of the Board of Trade. The new Board held its first meeting on January 5th, 1858. The arrangement with the Corporation of Liverpool was that the town dues were to become the property of the Dock Trustees on payment of £1,500,000; and the Dock Trustees were to take over £6,000,000 of the Corporation Debt, that sum being the estimated amount expended on harbour purposes. And the Birkenhead Dock Estate was made over to the Trustees, charged with the existing debt of £1,400,000.

At present the dock system begins at the North End with the Gladstone Dock, the first part of which was opened by the King in July 1913. When completed the two branches of this dock will have a water area of 25 acres, and with the graving dock, will be able to accommodate for loading, discharging, or repairing purposes, the largest vessels now afloat. From these docks to the Herculaneum Dock, at the South End, is a distance of nearly seven miles, with dock accommodation along its whole length. The water area of the docks measures about 450 acres. On the opposite side of the river are the Birkenhead Docks, having a water area of 172 acres and a quay length of 10 miles.

Taking the docks separately, beginning at the

North End with those actually available for shipping, there is first of all the Hornby Dock which is the centre of the timber trade; then comes the Alexandra Dock, used principally by South American and Mediterranean traders. Adjoining this are the Langton and the Brocklebank Docks, which are entered from the Canada Basin. In these are to be found ships trading to the Mediterranean, Central and South America, and Australasia. Further south come the Canada, Huskisson, and Sandon Docks, where several of the greatest North Atlantic liners are berthed. Then come the Wellington, the Bramley-Moore, and the Nelson Docks, the head-quarters of continental and coasting lines. Then the Collingwood, Clarence, Trafalgar, Victoria, Waterloo, Princes, Canning, and Salthouse Docks which give accommodation to coasting traders. These docks are also used by sailing ships, and vessels importing grain, nitrate, and sugar.

The King's Docks are used by large vessels generally; the Queen's Docks, which adjoin, accommodate some Continental vessels, and in its branches are found steamers trading to South America, China, and other distant countries. In the Coburg Dock, which is sandwiched in between the Queen's and the Brunswick Docks, are berthed the Isle of Man cargo steamers, and vessels trading to the Canary Islands and the Peninsula. In the adjoining Brunswick Docks are steamers trading to India, South Africa, and the River Plate and Cuba, together with large vessels taking part in the general work of the Port. In the next docks, the Toxteth and the Harrington, are found liners in the Indian and West Coast of Africa trades. Finally the Herculaneum Dock serves as a basin for vessels entering the Harrington and Toxteth Docks, or going into the adjoining graving docks. The Herculaneum branch dock is solely for the use of steamers and barges loading coal, or vessels discharging petroleum in bulk. The oil is pumped into tanks on the Parkhill Estate belonging to the Harbour Board.

On the opposite side of the river are the Birkenhead Docks. The first of these is the Alfred Dock, which gives access to the great Float and the adjoining docks. The Alfred Dock itself is used for vessels loading outwards. The Floats are principally used for coaling purposes, or by ships undergoing repair. They also contain quay accommodation rented to private firms, and for the discharge of petroleum. The Vittoria and Wallasey Docks are used by steamers in the Far Eastern and South African trades, for grain ships, and for general purposes. In the Egerton and Morpeth Docks are vessels trading to India, China, and South Africa, but these docks are used also for general purposes.

The following table is of interest in that it gives the date of opening, and the water area of some of the docks under the Mersey Docks and Harbour Board, and thus shows the development of the dock system of Liverpool :—

Liverpool Docks

Date when opened.	Name.	Water area in acres.
1715	(Pool), filled in in 1826 to form the site for the Custom House	4
1753	Salthouse Dock	6½
1761	George's Dock, closed and filled in in 1900 as site for Dock Offices.	
1788	King's Dock	9
1796	Queen's Dock	21¾
1821	Princes Dock	14¾
,,	Union Dock, subsequently formed into the Coburg Dock	7¾
1830	Clarence Dock	10½
1832	Brunswick Dock	17
1834	Waterloo Dock, reconstructed in 1867	6
1836	Victoria Dock	6
,,	Tralfagar Dock	6½
1846	Albert Dock	7¾
1847	Morpeth Dock, Birkenhead, extended in 1860	17
,,	Egerton Dock, Birkenhead	4
1848	Salisbury Dock	3½
,,	Collingwood Dock	5
,,	Stanley Dock	3¾
,,	Nelson Dock	8
,,	Bramley-Moore Dock	9¾
1849	Wellington Dock	8
1851	Sandon Dock	25

Date when opened.	Name.	Water area in acres.
1852	Huskisson Dock	37½
1859	Canada Dock	47
1864	Herculaneum Dock . . .	9¾
1881	Brocklebank Dock . . .	20½
,,	Langton Dock	20¾
,,	Alexandra Dock	44½
1883	Hornby Dock	17
1884	Harrington Dock	9
1888	Toxteth Dock	11¼
1898	Great additions and greater depth of water added to Canada and Huskisson Docks. These now afford greater depth of water, and better accommodation for large liners than any other part of the system. Under the same Act the Southern System has been remodelled, giving deep water entrances to the Brunswick Dock; deepening the connection between the Brunswick and Toxteth, and the Brunswick and Coburg, and the Coburg and Queen's Docks; the deepening of the Queen's Docks and the construction of a graving dock and two branch docks, the deepening of the passage between Queen's Docks and the Wapping Dock, and the deepening of Wapping Dock.	84

Date when opened.	Name.	Water area in acres.
1913	Gladstone Docks partly opened. When completed these docks will include :— (1) A dock 1050 feet long, which can be used as a graving dock. This is now available. (2) A half-tide dock with river-lock entrance, 870 feet long and 130 feet wide. (3) A lock 645 feet long and 90 feet wide. (4) Two branch docks opening out of the half-tide dock . . .	25

The following table[1] of the amount of Dock Tonnage Rates on Vessels, and Dock Rates and Town Dues on Goods, received by the Mersey Docks and Harbour Board, shows the progress of the Port of Liverpool from the year 1752 to the year 1913. It is taken from the accounts published by the Mersey Docks and Harbour Board. From 1752 to 1871 the accounts were made up to the 24th of June each year; since 1872 the Board's year has ended on July 1st.

[1] The Accounts of the Mersey Docks and Harbour Board, 1913, p. 22.

Year.	No. of Vessels.	Tonnage.[1]	Duties.[2] £	s.	d.
1752	..	..	1,776	8	2
1760	1245	..	2,330	6	7
1770	2073	..	4,142	17	2
1780	2261	..	3,528	7	9
1790	4223	..	10,037	6	2½
1800	4746	450,060	23,379	13	6
1810	6729	734,391	65,782	1	0
1820	7276	805,033	94,412	11	10
1830	11,214	1,411,964	151,359	15	4
1840	15,998	2,445,708	178,196	14	0
1850	20,457	3,536,337	211,743	7	7
1860	21,136	4,697,238	547,465	5	1
1870	19,429	5,728,504	714,173	2	1
1880	20,070	7,524,533	982,378	4	4
1890	23,633	9,654,006	1,030,189	18	9
1900	24,870	12,380,917	1,042,926	15	0
1910	24,961	18,654,071	1,290,480	3	9
1913	24,982	18,433,269	1,578,604	8	0

[1] From 1858 this item in the original table is analysed into Tonnage paying Tonnage Rates and Harbour Lights, and Tonnage paying Harbour Rates only.

[2] From 1812 this item in the original is analysed into duties on tonnage and on goods. From 1858 there is further analysis of Tonnage paying Tonnage Rates and Harbour Lights, Tonnage paying Harbour Rates only: Dock Tonnage Rates on vessels; Dock Rates on goods, and Town Dues on goods. From 1905 Graving Dock and Gridiron Rates, and Dock Rent are also analysed.

The Rates and Dues were revised and reduced in December, 1880, in February 1884, and in July 1895.

A large reduction was made in the Dock Rates on cotton, which took effect on the 4th September, 1896.

The Rates and Dues were increased as from 1st December, 1911.

As has already been mentioned, Liverpool is the greatest exporting centre in the United Kingdom. The city is the natural outlet for the great manufacturing towns of Lancashire, and in addition to the export of what is produced in this extensive industrial district, the raw material of the great staple trade, cotton, has to be imported, and, in spite of the Manchester Docks, the greater part of the raw cotton imported into the United Kingdom enters at the Port of Liverpool. The large manufacturing population requires food-stuffs as well as raw material, hence Liverpool imports great quantities of meat and grain. In order of importance, the cotton exports rank first, with a total value of about £60,000,000, steel and iron goods and machinery amount to £25,000,000, woollens to £10,000,000. This great trade has had its effect upon the leading railway companies of the country, hence the facilities for transport and for the delivery and collection of goods in large quantities at the docks are second only to those of London. A great contrast between the two leading ports of the United Kingdom is that at London owing to the conditions of the river, the scattered nature of the docks, and the distances between docks and wharves, there is a great amount of work for barges and lighters, and a minimum of work for horse-carts and waggons, whereas at Liverpool the docks being concentrated and situated much nearer the sea, the reverse is the custom, there is as compared with London, but little work for the barge to do, but an enormous number of lorries and carts find employment in carting and collecting goods to and from the docks. This contrast accounts in some measure for the differences in the labour problems in the two ports. But that is a subject which cannot be entered upon in this present volume.

The Manchester Ship Canal and Docks

Although Liverpool is the natural inlet and outlet for the great manufacturing towns of Lancashire, a successful attempt has been made to provide, by artificial means, a port which may be for certain purposes more convenient and economical. A century and a half ago, Manchester, then a budding manufacturing centre, was being stifled owing to the lack of effective means of communication. Fortunately the Duke of Bridgewater owned coal-bearing lands in the vicinity. His Grace had been crossed in love; but instead of sulking he took his rebuff like a man, threw up the chances of a political life, and the allurements of London society, and retired to Lancashire to develop his estates. The needs of Manchester appealed to him with a twofold force. The town needed cheap coal in order to develop its industries, and it needed a means of communication with the outer world. For the existing roads were bad, and the river

Irwell was an uncertain waterway. In winter time flood or frost might, and sometimes did, cut the population of Manchester completely off from the outer world, and on more than one occasion famine had been experienced. The Duke had the good fortune to secure the services of James Brindley; and in a remarkably short time, the Duke's coal mines at Worsley were sending all the coal that Manchester needed along Brindley's canal. By a further effort, the canal system was extended so that Manchester was connected with Liverpool, and henceforth the possibility of world trading was opened up. How advantage was taken of the opportunity, and how the railway came to assist and then to supersede the canal for the transport of goods is common knowledge. For over a hundred years all went well, and the progress made was almost uninterrupted. But with a growing competition, Manchester and the district depending upon it began to feel the weight of heavy railway rates, and the cost of transhipment and the extra handling of goods, which might be rendered unnecessary if only large ocean-going steamers could be brought up to the City. The scheme for constructing a ship canal to Manchester, with dock equipment at the canal head, took shape, and was placed before the public. The leading spirit in urging forward the scheme was the late Mr Daniel Adamson. It was in the year 1882 that the agitation for the canal and docks took concrete form. A Bill giving the necessary powers to the promoters was presented to Parliament, where it was strenuously opposed by Liverpool, and by the railway companies of the district. However, the promoters proved their case, and Parliament passed the Bill in the year 1885. It was estimated that the cost of constructing the canal, with sufficient dock accommodation for the immediate future, would be about £5,330,000. When the canal was opened in 1894, although the equipment had been kept down to an irreducible minimum, the cost had mounted up to no less than £15,000,000, or nearly three times the sum mentioned in the estimate, whilst up to December 31st, 1912, the total expenditure on capital account had amounted to £16,865,249.

The canal commences at Eastham on the south side of the Mersey, just nineteen miles from the bar. The total length of the waterway from Eastham to Manchester is 35½ miles, and a uniform depth of 28 feet is maintained by dredging throughout the length of the canal. The minimum bottom width of the canal is 120 feet, with the exception of three-quarters of a mile from Warburton Bridge to the upper end of Millbank Wharf, where it is only 90 feet. At Eastham there are three parallel locks of different dimensions forming three separate entrances. The largest lock measures 600 feet long by 80 feet wide, whilst the smallest is only 150 feet by 30 feet. The time occupied in passing a large steamer through the principal lock is only eight minutes.

Throughout the length of the canal the Company have given facilities for the erection of wharves with a water frontage, and some of these wharves are capable of accommodating vessels of large dimensions. At Runcorn and at Manchester there are docks belonging to the Ship Canal Company. The Runcorn docks cover an area of 70 acres, of which 15 acres is water space, and there is an additional area of 77 acres for storage purposes. The water area includes a tidal basin and five docks. The imports here consist chiefly of pottery materials, timber, road metal, pig iron, and grain; the exports of coal, salt, pitch, hardware and earthenware. Facilities for the collection and distribution of goods are afforded by the Bridgewater Canal and the London and North Western Railway. At Manchester provision has been made for the construction of nine docks, and of these, eight have already been constructed and opened to shipping. The dock estate, above Mode Wheel Locks, covers an area of 406 acres, and includes a water area of 120 acres, having quays six and a half miles long, amply provided with good sheds, some of which rise to a height of five floors. The Canal Company own 84 miles of railway, which connect the dock system with the main railway companies of the district. There is also inland water communication by means of connections with fourteen barge canals. In a word, thanks to the Ship Canal, Manchester enjoys all the facilities and benefits of a good modern seaport, and the effect on the trade and commerce of the district has been considerable. Railway rates, and through freights have decreased, and the volume of business has steadily increased. Indeed the railway companies which opposed the canal scheme when it was before Parliament have been by no means the least to benefit by its construction. The ordinary shareholders, however, have not hitherto seen any return on the capital they advanced, and although the debenture interest is being paid in full, and there is a small balance left after doing so, it will probably be some years yet before the original shareholders earn their reward. In order to make the financial position of the Ship Canal Company clear, there are 400,000 fully paid ordinary shares of £10 each, and the same amount of perpetual 5 per cent. Preference Shares; neither of these have received any return since the Company began working. The Corporation of Manchester holds £1,061,230 of 3½ per cent. Preference Stock;[1] no interest has been paid on this, but as the stock is non-cumulative, there are no arrears. Then there is capital raised by Loans and Debentures to the amount of £8,007,000, of which £1,048,000 matures this year (1914).

The holders of this have the option of converting their holding into a perpetual debenture, but the Corporation of Manchester is prepared to take over any amount that holders may refuse to convert. The Act of last session which authorised the Corporation to assist the Company thus, also empowered

[1] In February 1914, 2½ per cent. was paid on this stock, and a sum of £22,280 was carried forward.

the Corporation to lend the Company another £1,000,000 to be expended on works and improvements. But that the Corporation has been wise in undertaking this further responsibility is shown by the growth of the Ship Canal Company's business. Nearly 5,000,000 [1] tons of goods passed along the canal during the first eleven months of the year 1913, and statistics show that there has been steady and progressive growth of business since the opening in 1894, when about 930,000 tons of goods paid toll. The average growth of receipts during the nineteen years of full working, has been nearly £27,000 a year. During this period, Manchester from being an inland town has become the fifth seaport of the United Kingdom, with a total annual value of imports and exports of nearly £57,000,000, taking rank before either Glasgow or Southampton. Nor is the phenomenal growth of Manchester as a port to be wondered at, for the city is situated in one of the most densely populated parts of the kingdom, and is the most convenient source of supply to about 170 towns. The area in which these towns are situated is nearer to Manchester than to any other seaport of the first rank, and contains a population of over 9,000,000 people. The population within economic carting distance of the Manchester Docks numbers over 2,000,000. The majority of these people are engaged in the manufacturing industries of Lancashire, which means that there is a very considerable quantity of raw

[1] For the whole yeaı, 5,780,161 tons.

materials and foodstuffs to transport to the district, and a large amount of manufactured goods to handle either for home or for foreign consumption. It was expected at first that the Manchester Docks would attract raw cotton imports to the detriment of Liverpool—this expectation has, however, been disappointed. The great market for raw cotton remains at Liverpool, but the Manchester Cotton Association is strongly developing its market, and Liverpool brokers find it to their advantage to attend there. Manchester and Liverpool import about equal quantities of Egyptian cotton, but of American cotton, which is at present the main source of supply, the Manchester import is inconsiderable. During the past year, however, a direct service of steamships has been organised between Manchester and New York by the White Star and Lamport and Holt lines, and the steamers are returning to Manchester with full cargoes. This service is additional to the fortnightly sailings of the Lamport and Holt steamers from New York to Manchester, which have been maintained ever since the opening of the Ship Canal. There have also been other developments during the past twelve months, including monthly direct services to Cochin, Calicut, and Tuticorin, after calling at Bombay, and increased services to the Continent. The chief commodities imported are timber and grain; fruit used to figure in the returns among the principal imports, but the banana ships are being diverted to other ports. The Customs-Port of Manchester commences at the eastern boundary of the Port of Liverpool, *i.e.* at an imaginary straight line drawn across the river Mersey from Dungeon Point on the Lancashire side, to Ince Ferry on the Cheshire side, and includes the river Mersey above this line, and the river Irwell so far as both are navigable, the river Weaver to Frodsham Bridge, and the Manchester Ship Canal from its entrance at Eastham (where it touches the Port of Liverpool) to Hunts Bank in the city of Manchester, with all channels, havens, streams, creeks, cuts, and docks within these limits.

The Ship Canal was opened for traffic on January 19th, 1894, and was formally inaugurated by Queen Victoria on May the 21st following. Dock No. 9 was opened by King Edward and Queen Alexandra on the 13th July, 1905.

The following statement shows the growth of traffic and receipts of the Port of Manchester since 1894 :—

Year.	Sea-borne Traffic (Tons).	Barge Traffic (Tons).	Total Tons.	Receipts.
				£
1894	686,158	239,501	925,659	97,901
1895	1,087,443	271,432	1,358,875	137,474
1900	2,784,843	275,673	3,060,516	290,830
1905	3,993,110	260,244	4,253,354	449,436
1910	4,618,070	319,561	4,937,631	555,735
1912	5,021,691	318,193	5,339,884	605,179
1913	5,457,218	322,943	5,780,161	

CHAPTER IV

GLASGOW AND THE CLYDE NAVIGATION

There is a certain resemblance between the ports of Glasgow and Manchester, for neither were apparently intended by nature to be great seaports, but the enterprise of their citizens has overcome natural obstacles so successfully that the largest ocean-going steamers can be built and docked at Glasgow, and at Manchester all but the largest vessels are able to frequent the Port. Glasgow, although an ancient town, is a comparatively modern Port. The Clyde at Glasgow and for some miles below was a wide stream, blocked to navigation by many shoals—the most unlikely place in the world for the building or docking of 50,000-ton steamers. But as frequently happens, the seeming unkindness of nature stirred up the spirit of enterprise. In the middle of the seventeenth century the townsmen of Glasgow, seeing that it was impossible for the small craft of that day to come up the river to the city, purchased 13 acres of land at Newark, 20 miles down stream, and there constructed Port Glasgow which consists of a harbour and a graving-dock. This was in the year 1668, and for nearly a century nothing further was attempted. But at the end of that time the wonders that Brindley was working in England by means of canal construction and inland navigation, appealed to the citizens of Glasgow as a possible means of effecting what they very greatly desired, in the interests of their coal and iron industries, the possibility of ships ascending the Clyde to Glasgow itself.

The population of the city was then about 24,000, among whom were commercial leaders who were determined to make the most of the developments of trade. It was decided to consult Smeaton as to the best means to deepen and improve the river. Between Glasgow and Renfrew, a distance of but five or six miles, Smeaton found no less than twelve shoals, some of which had but little more than a foot depth of water at low tide. But his scheme which consisted of a weir and a lock four miles below Glasgow Bridge, by means of which vessels up to about 70 feet long and drawing 4½ feet of water could proceed to Glasgow, was not approved, and for another decade nothing was attempted. In the year 1768, however, John Golborne of Chester was called in, and he reported that the river had been allowed to expand too much. He did not think that a great amount could be effected, but he suggested restricting the width of the stream by means of stone jetties, and by deepening the channel. For an expenditure of somewhat less than £9000 he hoped to get a depth of water at Glasgow of about five feet. The scheme was adopted, and an Act of Parliament was obtained in the year 1770.

The work was carried out with the result that the depth of water obtained was one foot greater than had been expected. Subsequently the ends of Golborne's jetties were connected by retaining walls, and the stream was so much improved that in the year 1806 the *Harmony* of Liverpool, measuring 120 tons and drawing 8½ feet of water was able to reach Glasgow safely.

Three years later the authorities obtained powers to deepen the river between Glasgow and Dumbarton, a distance of nearly 14 miles. Twelve years after the success of the *Comet* in 1812, the first steam dredger was set to work on the river, and twelve months later an Act was passed authorising the deepening of the river to 13 feet at neap tides from Glasgow to Port Glasgow.

An important Act was passed in 1840, which empowered the authorities to straighten, widen, and deepen the river. The result of all this work was that by 1858 the average depth between the Kelvin and Port Glasgow was about 20 feet at high water during spring tides, and that ships drawing nearly 18 feet could proceed up to Glasgow on the top of spring tides. But this was only during *spring tides*, at other times ships might be seriously delayed, either through having to wait for spring tides, or by having to complete loading at Greenock. The main secret of the improvements on the Clyde is the use of the steam dredger, which has been utilised with growing success since 1824. The effect of this active policy has been to deepen the river so that the bed is now practically level from Port Glasgow to Glasgow, and vessels drawing up to 29 feet 6 inches can be accommodated. Thus it is practically true to say that the Clyde has been canalised between Glasgow and Erskine Ferry, a distance of about 10 miles, and to some extent it may be said that Glasgow, like Manchester, is connected with the sea by a ship canal.

Originally the business of the river and port was managed by the magistrates of Glasgow, but in the year 1809 by Act of Parliament the Municipality were formed into a separate body, and as Statutory Trustees were authorised to borrow money on the security of the dues. From 1809 to 1825 the Trustees consisted entirely of the Magistrates of Glasgow; but in the year 1825, five merchants and traders connected with the port were added to the Authority, and this arrangement lasted for fifteen years. In the year 1840 the constitution of the Trust was modified, the number of the Trustees being increased to thirty-three, and the users of the port were accorded a greater representation. Eighteen years later the number of Trustees was reduced to twenty-five, the Corporation members being lessened in number; this arrangement continued until 1905 when the present constitution came into force. Under this the Municipality as such has no control over or responsibility for the river. The Trustees of the Clyde Navigation now number forty-two members, of whom ten represent the Corporation of Glasgow; the Town Councils of

Govan, Partick, Dumbarton, Renfrew, and Clydebank, and the County Council of Dumbarton are represented by one each; the Chamber of Commerce, the County Council of Lanark, the Merchants House, and the Traders House each appoint two, and the shipowners using the port, and payers of dues elect eighteen. The qualification of an elector is that he be a British subject resident in the United Kingdom, and pay a minimum of £10 annually in dues to the Trustees. The elected Trustees must have similar qualifications, but pay a minimum of £25 in dues. The jurisdiction of the Trustees extends from Albert Bridge, Glasgow, to Port Glasgow, a distance of about 18½ miles. From Port Glasgow to deep water, a distance of about four miles, the channel is under the care of the Clyde Lighthouses Trustees, whilst the Harbour accommodation at Greenock is under the Greenock Harbour Trust. Recently a dispute has been in progress between the latter body of Trustees and their bondholders; and this dispute has led to the suggestion that there should be one Port Trust [1] created to control the whole of the shipping accommodation on the Clyde. The realisation of this suggestion would bring a unification and simplification of management which would place Glasgow in line with London and Liverpool in this respect.

The duties of the Trustees, as laid down by the Act, are to construct the necessary quays, sheds,

[1] *Cf.* Letter from Lord Inverclyde. *The Shipping World*, Dec. 4, 1912, p. 489.

and other facilities, and to deepen, widen, straighten, and maintain the river Clyde in order to meet all modern requirements. They are empowered to borrow money, and to levy rates on vessels and goods for services rendered.

During the past fifty years the length of quay for the accommodation of shipping has increased from about two miles to twelve. The method of constructing the quays consists, for the most part, of solid walls founded on concrete caissons. Whilst on the quays, sheds from 60 to 100 feet wide have been constructed for the reception of goods in transit, there is but little warehousing done, but the Trustees own a silo and floor granary capable of storing over 30,000 tons of grain. The bed of the river has been lowered from 29 to 36 feet. The improvement of the channel is constantly in progress and for this purpose the Trustees have a large number of dredgers, some of which are capable of dredging in 48 feet of water. The materials dredged are carried out to sea by hoppers.

The shipping accommodation for which the Trustees are responsible consists of the quays as described above, these being partly on the open river, and partly in wet docks. These consist of four tidal basins, the Kingston Dock, having a water area of 9 acres, the Queen's Dock, with 80 acres, and the Prince's and Rothesay Docks, each having 76 acres of water area. These basins at p esent contain fully one-half of the quay accommodation of the Port. There is no necessity for dock gates, the range of the tide being only about 10 feet. The jurisdiction of the Trustees extends over 18 miles from Glasgow, but there are no docks of importance beyond seven miles from the city till Greenock. The Trustees own three graving docks, one of which is 880 feet long. The total amount spent by the Trustee on the improvements of the river and the provision of accommodation for shipping and goods has been about £10,000,000, of which £7,000,000 have been borrowed. During the summer of 1913 the Trustees decided to apply to Parliament for powers to utilise their estate of 405 acres at Braehead for the construction of five new basins. Two of these will be constructed as soon as the necessary powers are obtained. The whole, when completed, will contain about six miles of quay accommodation. The plans are drawn so as to give the most modern facilities to the largest ocean going steamers, and the scheme includes the construction of a graving dock over 1000 feet long.

Glasgow is a great manufacturing centre, and has the advantage of being situated in the midst of extensive coalfields and near large supplies of ironstone. Hence the heavy industries predominate. The principal commodities exported are coal, iron, steel goods, and machinery; whilst the principal imports consist of grain, flour, fruit, timber, and ores of various descriptions. The exports exceed the imports in value by about 10 per cent., and the foreign traffic is considerably greater than the coastwise.

The following table shows how the business of the Port has grown since the year 1770 :—

Year.	Tonnage of Vessels.	Tonnage of Goods.	Total Revenue.		
			£	s.	d.
From July 1752 to July 1770	..	..	147	0	10
1771 (one year)	..	..	1,044	10	0
1780	..	..	1,515	8	4
1790	..	..	2,239	0	4
1800	..	..	3,319	16	1
1810	..	..	6,676	7	6
1820	..	..	6,328	18	10
1830	..	..	20,296	18	6
1840	..	..	46,536	14	0
1850	..	..	64,243	14	11
1858	2,129,782	1,154,798	78,783	17	6
1860	2,897,738	1,192,475	97,983	18	1
1870	3,764,220	1,921,221	164,093	2	10
1880	5,768,102	2,653,088	223,709	0	8
1890	6,728,990	4,794,562	356,202	11	3
1900	8,723,194	7,215,368	441,419	10	6
1910	12,354,788	10,097,283	555,403	6	9
1913	..	..	624,826	9	6

CHAPTER V

THE BRISTOL CHANNEL PORTS

Bristol.—On the south side of the Bristol Channel about six miles up the river Avon stands Bristol, one of the oldest and most historic towns of England, and at one time a most important shipping centre. It was thence that the Cabots and some of the navigators who explored the New World sailed, about a century before Liverpool commenced her career as a seaport town. On the other side of the Bristol Channel are situated a series of ports and docks, whose position in the world of commerce is due to their proximity to the famous steam coal of South Wales. Beginning with Newport, the most easterly, there follow, Cardiff, Penarth, Barry, and Swansea. Bristol, which for a time seemed likely to decay owing to the dimensions of the Avon, has shown her vitality by resuming her place among the important shipping centres of the United Kingdom. A remarkable development has resulted in nearly doubling the value of her export and import trade during the last fifteen years. In the year 1897, the total value of the foreign trade of Bristol amounted to just over eleven and a half million pounds, in 1912 it had increased to twenty-one and a half millions, while the tonnage entering the port has increased from 643,217 tons in 1850 to 2,433,985 in 1913. In the early days of steam it seemed likely that Bristol would become the great port of departure for the United States. The *Great Western* and the *Great Britain* were both built there. But the business genius of Mr Cunard secured for Liverpool the first contract for the conveyance of the Atlantic mails by steamer, and the growing tonnage of the Atlantic liners gave the Mersey port the premier position; for the Avon is but a stream compared with the Mersey.

Nor did the men of Bristol endeavour, as did the townsmen of Glasgow, to effect by artificial means what nature appeared to withhold. Perhaps the Avon was incapable of canalisation on a large scale; be this as it may, it was decided that as the deep waters of the Bristol Channel were within a distance of seven miles of the city, a port should be created at the mouth of the Avon. Thus the construction of the docks at Avonmouth and Portishead initiated a policy which had been reversed in the case of Glasgow many a decade before. The largest cargo steamers are now accommodated six and a half miles from Bristol. One of the great difficulties of the Port is the rise and fall of the tide, which has a range at spring tides of 36 feet and at neap tides of 21 feet.

The Port of Bristol has from time immemorial been under the authority of the Corporation of the city. But the docks owed their construction to the

Bristol Dock Company, a body composed partly of the Corporation and partly of merchants and traders. In the year 1803 this company obtained powers to improve the shipping accommodation on the Avon, and eventually about three miles of the river at Bristol was made into a harbour by cutting a new channel for the Avon, and converting the old channel and a branch of the Frome into "The Float." Various improvements were carried out by the Dock Company until in the year 1847, the *dual* management was found to cause too much friction, and this threatened the prosperity of the Port to such an extent that an agitation by the citizens led to the purchase of the docks by the Corporation and a consequent unification of control. It was later on proposed to develop the dock system thus commenced, so that it would extend from Bristol right down to the mouth of the Avon. But the Corporation decided in the year 1884 to acquire the docks at Portishead and Avonmouth, situated on either side of the entrance to the Avon, and so obtain control over the whole Port. These docks had been constructed by private enterprise under powers obtained in the years 1864 and 1871 respectively. There had been growing complaints that the City Docks were ceasing to be adequate for modern requirements. The Corporation of the time did not feel justified in incurring the full liability for constructing docks so far from the city, but assisted the Portishead Company to the extent of £100,000.

When these docks at the mouth of the Avon were opened, it was found that there was a growing competition between them and the City Docks, to the detriment of the latter. Finally the citizens determined that the Corporation of Bristol must have authority over the whole Port. Thus in the year 1884 both the Portishead and Avonmouth undertakings were purchased by the city.

The Bristol Docks have been rate-aided since 1848; the amount of the contribution varying from fourpence to one shilling and tenpence in the pound. The heavy rate was occasioned by the construction of the King Edward Dock at Avonmouth, the cost of which was about £3,000,000. The rate in aid, however, now that this dock is opened, is being gradually decreased, the rate this year (1914) being one shilling and fivepence halfpenny.

At the time when the Corporation purchased the docks at the mouth of the river the accommodation provided was ample for the shipping visiting the port, but with the continued increase in the dimensions of steamers, it became necessary, if Bristol was to hold her position as a shipping centre, to make a further development. The result has been that the Corporation decided to construct a large modern dock at Avonmouth, adjacent to the existing dock, and with an entrance to the deep-water channel of Kingroad. The first sod of this new dock was cut by the present King, when Prince of Wales, in 1903, and the dock was opened by King Edward, after whom it has been named the Royal Edward

Dock, on July 9th, 1908. At the present moment the dock accommodation of Bristol consists of :

(1) The City Docks, having a water area of 83 acres and a quay length of nearly 15,000 feet. The depth of water on the docksill varies from 33 feet at spring tides to 23 feet at neap tides.

(2) The Portishead Dock, which has a water area of 12 acres, and a quay length of 2829 feet. The entrance lock is 472 feet long by 66 feet wide, and the depth of water on the sill varies from 34 feet at spring tides to 24 feet at neap tides.

(3) The Avonmouth Dock, which has a water area of 19 acres, the quay having a length of 4800 feet. The length of the entrance lock is 488 feet and the width is 70 feet. The depth of water on the sill varies from 38 feet at spring tides to 28 feet at neap tides.

(4) The Royal Edward Dock (at Avonmouth), which is one of the finest docks in the world. It has a water area of 30 acres, with quays measuring 4392 feet long. The entrance lock is 875 feet long and has a width of 100 feet. The depth of water on the sill varies from 46 feet at spring tides, to 36 feet at neap tides. This dock can accommodate the largest vessels now afloat, but the very largest vessels cannot use the graving docks at Avonmouth, the length of the largest being 875 feet, which is a few feet shorter than the *Olympic* ; but the dock is amply large enough for vessels of the size of the *Mauretania* and *Lusitania*, or any cargo steamers likely to dock at Avonmouth for some time to come.

TABLE showing Registered Tonnage of Vessels that have entered the Port of Bristol from foreign parts and coastwise from 1850 to 1913, with statement of Revenue from rates and dues on Shipping and Goods from 1810 to 1913.

Year ending 30th April.	Shipping.		Total.	Revenue from						Total.		
	Foreign.	Coast-wise.		Shipping.			Goods.					
	Tons.	Tons.	Tons.	£	s.	d.	£	s.	d.	£	s.	d.
1810	..	..	..	8,185	1	8	6,952	17	7	15,137	19	3
1820	..	..	..	11,090	13	9	7,924	14	3	19,015	8	0
1830	..	..	..	15,998	12	8	8,087	1	0	24,085	13	8
1840	..	..	..	17,999	7	2	7,536	9	4	25,535	16	6
1850	129,254	513,963	643,217	12,088	1	10	8,905	1	9	20,993	3	7
1860	206,723	504,970	711,693	19,328	15	4	12,073	9	6	31,402	4	10
1870	355,921	593,130	949,051	24,211	7	1	13,214	13	9	37,426	0	10
1880	521,797	651,576	1,173,373	25,216	8	7	12,281	14	0	37,498	2	7
1890	624,222	669,151	1,293,373	40,535	15	6	27,621	18	1	68,157	13	7
1900	847,632	764,098	1,611,730	51,420	16	1	43,883	16	2	95,304	12	3
1910	1,384,135	750,457	2,134,592	63,877	16	8	67,251	19	3	131,129	15	11
1913	1,577,361	856,624	2,433,985	75,341	16	0	86,941	0	9	162,282	16	9

SWANSEA.—Of the ports on the other side of the Bristol Channel practically all, except Swansea, are railway ports, for even Cardiff, which as a port may be said to be the creation of the Bute family, is now managed by the Cardiff Railway Company.

The development of Swansea began about two centuries ago, when the copper smelting industry was established there in the year 1717. The port enjoys several advantages, it is one of the westernmost ports of the Kingdom and yet is excellently sheltered; it is adjacent to the South Welsh coalfield, and enjoys a practical monopoly of the export of anthracite; the tinplate industry, too, has been established there, and its development has been such that, without protection, no other part of the world could compete with Swansea plates either in excellence or price.

The history of Swansea as a port can be told quite shortly. In the year 1791 Harbour Trustees were appointed, whose duty it was to deepen and widen the entrance to the river Tawe. Seven years later, the South Welsh coalfield was connected to Swansea by a canal about sixteen miles long. Then railways came; and in the year 1872 the canal was purchased by the Great Western Railway Company. The work of the port grew to such an extent, that in 1851 a new channel was cut for the river, and the old channel was converted into a wet dock for shipping. This forms the North Dock, and has with its basins a water area of

14 acres. The construction of the South Dock was commenced in the year 1847 by a private company, but before its completion it was transferred to the Harbour Trustees, and was finally opened in 1859. This dock with its basins has a water area of 18½ acres. The scheme for constructing the Prince of Wales Dock was approved in the year 1874, and the dock was opened in 1881. Seventeen years later the dock was enlarged and now has a water area of 28 acres. The rapidly increasing demand for anthracite coal necessitated the provision of further shipping accommodation. To meet this the King's Dock, covering, with its basin, a water area of 71 acres was opened in the year 1904. At present the port has a total dock area of 131½ acres, with over six miles of quay space; the whole, together with the railway system of over 20 miles of track, is managed by Trustees, who are now a Board of twenty-six members. Owing to the concentration of many metal-working industries in the district, Swansea has been called the *Metallurgical Capital of Wales*.

Number and Registered Tonnage of Steam and Sailing Vessels entering Swansea Harbour during the following years, ending December 31st, from 1768 to 1912.

(*From the Statement issued by the Trustees of the Swansea Harbour Trust. February* 1913.)

Year.	Totals of Steamers and Sailing Vessels.		Total of Imports and Exports.	Amount of Coal Exported (exclusive of bunker coal). From Browne's Export List.
	Number.	Tons Register.	Tonnage.	Tons.
1768	697	30,631	..	..
1790	1,667	74,926	..	..
1800	2,590	154,264	..	..
1820	2,495	156,971	..	..
1835	3,699	237,418	..	..
1865	5,504	700,177	1,388,000	..
1875	5,496	735,322	1,549,000	..
1885	4,978	1,185,767	2,484,704	846,627
1890	4,778	1,499,529	2,969,246	958,658
1900	5,042	2,048,002	4,104,514	1,859,747
1910	5,642	2,776,809	5,783,056	2,703,362
1912	5,503	2,988,702	6,304,173	2,995,372
1913	5,832	3,344,777	7,231,250	

Cardiff.—The Customs port of Cardiff extends from a point to the west of Barry to the river Rhymney, and includes the Barry and Penarth Docks and Ely Harbour, as well as the Bute Dock system in Cardiff proper. The total dock area of the group of ports is 358 acres, and these together comprise the greatest and most progressive coal port in the world. During the past fifteen years the value of imports and exports has more than doubled, increasing from £9,804,494 in 1897 to £20,096,887 in 1912. These figures are doubtless swelled somewhat by the increased prices of goods, notably of coal; but the figures for shipping entered and cleared are almost as remarkable, having increased from 11,990,709 tons net in 1897 to 15,405,059 in 1912. It may be noted, too, that the tonnage *cleared* from the Port of Cardiff is greater than that cleared from Liverpool, and on several occasions has exceeded that *cleared* from London, *e.g.* in the years [1] 1899, 1900, 1901, 1902, 1906, 1907, 1908, 1909, 1912. The weight of exports and imports together, from and to Cardiff, more than trebled in thirty years, increasing from 8,286,415 tons in 1880 to 26,767,194 tons in the year 1910. Coal is of course the chief export; but of imported commodities there is a large quantity of iron ore, besides pit-props, grain, and timber; and Cardiff now ranks next to London and Liverpool for the quantity of frozen meat discharged at the port.

The Bute Docks, which include the East and West Bute Docks, Roath Basin and Dock, and the Queen Alexandra Dock (and their dependencies), owe their existence and importance to the Marquisses of Bute. It was about the year 1830 that the second Marquis of Bute decided that there was a future for the port of Cardiff. This decision was an instance

[1] *Cf.* Statistical Abstract for the United Kingdom, 1913, Table 66.

of commercial statesmanship which shows the value of business capacity. If Cardiff had waited for municipal enterprise and the working of collectivism to develop a port, it is doubtful whether it would ever have become the greatest and most progressive coal port in the world.

In the year 1830 the Marquis obtained powers which enabled him, nine years later, to open the West Bute Dock. The Dock has a water area of 18 acres, and a basin one and a half acres in extent. Small as this dock is, it was sufficient for the export of coal for the following sixteen years, when the East Bute Dock was constructed. When this new dock was projected, the future was much more defined. A policy with a certain amount of uncertainty, and even speculation about it had been justified, and business foresight could foretell developments justifying a much larger scheme. The East Dock has been reconstructed since 1855, and now has an area of 44 acres with a basin of 2¼ acres. With the development of the steamer, and the growing popularity of the South Welsh steam coal, further developments became necessary, and so within twenty years the Roath Dock and Basin were added to the accommodation of the port. By the year 1870 the export of coal from Cardiff had increased from 125,000 tons in 1830, to no less than 2,000,000 tons annually. The Roath Dock has an area of 33 acres, and over 6,000 feet length of quay; the basin, which is twelve acres in extent, furnishes another 3000 feet of quay space.

Between the opening of this dock in 1874 and the early years of this century, the export of coal had increased fivefold, and with somewhere about 10,000,000 tons of coal to handle, further accommodation was urgently needed. This led to the construction of the Alexandra Dock which was opened by King Edward in the year 1907. This dock provides for future developments. It is half a mile long, and varies in width from 800 to 1000 feet, whilst the depth is 50 feet, thus all but the largest steamers afloat can be accommodated. The Alexandra Dock is connected by a cutting with the Roath Dock, the two forming a dock of 85 acres of level water. The entrance lock is 850 feet long and 90 feet wide. The coal export trade is carried on on the south side of the dock, which is equipped with the most modern machinery for the purpose. Steamers discharge cargo on the north side of the dock, which is reserved for the import trade. The annual imports of Cardiff include about half a million tons of pit-props, 130,000 loads of timber, nearly a million tons of iron ore, and between 300,000 and 400,000 tons of grain and flour. Cold storage is provided in the Roath Dock where there is a three-storied shed having a storage capacity of 125,000 cubic feet.

The Bute Docks have communication with the principal railway systems of the country, the Midland and the London and North Western giving direct communication with the principal manufacturing districts. The population in the vicinity of Cardiff is growing rapidly in numbers. Within a radius of 30 miles there are no less than 1,130,000 people, and within a 90-mile radius there is a population of considerably over 8 millions.

PENARTH.—The Penarth Dock is managed by the Taff Vale Railway Company, being held under a lease for 999 years. The story of the construction of the dock, and how the Taff Vale Company obtained the management of it in spite of the efforts of Lord Bute to prevent competition with the Cardiff Docks, forms a very interesting chapter in the commercial history of South Wales. Penarth Head is within a mile of Cardiff at the mouth of the river Ely. Six years after Lord Bute obtained powers to construct the West Bute Dock, the Taff Vale Railway Company was formed, and obtained powers to construct a railway from Merthyr Tydfil to Cardiff. This was to be a branch line running to Cogan Pill, where later on the Penarth Dock was constructed. But to prevent possible competition Lord Bute approached the Taff Vale directors, and a compromise was arranged. Under this agreement Lord Bute gave the Taff Vale Company access to the West Bute Dock, on condition that the Company should run their system into the Dock, and lease a considerable section of the quay accommodation there. In return for this concession, the Company was to abandon its projected branch line to Cogan Pill, and the railway company bound itself to arrange that all goods for shipment carried over its system should be either shipped from the West Bute Dock, or dues should be paid on them as though they had been so shipped. But when in the year 1855 Lord Bute constructed the East Bute Dock, there was considerable friction between him and the Taff Vale Company, because he refused to give the Company the same facilities as it enjoyed at the older dock—these facilities being accorded to the Rhymney Railway Company, which had just been incorporated. For eleven years the Taff Vale Company waited before it obtained equal treatment at the new dock. Ten years later, *i.e.* in the year 1865, another Company having obtained powers to construct a dock at Cogan Pill, leased this dock to the Taff Vale Company. The Marquis of Bute then attempted to enforce the terms of the original agreement between himself and the Taff Vale Company, to the effect that either all goods passing over their system for shipment should be shipped at the West Bute Dock, or dues should be paid to him as though they had been. The Taff Vale Company won their case, but only by taking it right up to the House of Lords. Since that event the progress of the Penarth Dock, as the Cogan Pill Dock was called, has been continuous. The dock was opened in 1865, and enlarged in the year 1884. The water area of the dock and basin is 26 acres, the entrance lock measures 270 feet long by 60 feet wide.

THE BARRY DOCKS.—With increasing shipments of Welsh coal, it was obviously to the interests of the collieries to have additional port facilities to those supplied by Cardiff. It was thus decided to construct a new port, and the Island of Barry, which is situated off the Glamorganshire coast about 9 miles south-west from Cardiff, offered several advantages, and was selected for the purpose. It was found possible to create a port and docks by constructing breakwaters and entrances. Thus the Barry Dock and Railway Company was incorporated in the year 1884. The first dock was opened in 1889 and the second in 1898. In 1891 the name of the company was changed to the Barry Railway Company. The docks and railways now in operation comprise about 65 miles of railway, which gives very complete connection between the docks and all parts, not only of the Welsh coalfield, but of the Kingdom. The docks, which include two wet docks and a basin, have a water area of 114 acres. The length of the quays in the three docks is 19,540 feet. The graving docks offer special facilities for the dry-docking of vessels, the two largest being 867 and 778 feet long respectively. They can both be divided into two graving docks, so as to economically accommodate small vessels. These docks are capable of accommodating all but the largest vessels now afloat.

The success of the Company was such that, within ten years, enlargement of the water area became necessary. In twenty years, from 1890, the business of the port was trebled. In the year 1890, 1,733 vessels having a measurement of

1,692,223 register tons loaded at Barry. The total weight of imports and exports that year was 3,265,296 tons. By the year 1910 these figures had increased to 3,267 vessels, measuring 4,314,023 tons; and the total imports and exports amounted to 10,383,782 tons.

The Port of Cardiff thus includes dock accommodation in the city of Cardiff itself, and the Penarth and Barry Docks, the latter being about nine miles distant from the city.

This group of docks forms the greatest and most progressive coal port in the world, indeed of recent years its development has been phenomenal.

An account of COAL (*exclusive of bunkers*) exported foreign from the Customs Port of Cardiff:

Year.	Tons.
1880	4,897,440
1885	7,132,133
1890	9,481,802
1895	11,067,403
1900	13,461,027
1905	14,080,855
1910	16,931,403
1912	17,252,014
1913	19,328,833

NEWPORT.—Whilst Swansea, situated at the westernmost limit of the South Welsh coalfield, enjoys a practical monopoly of the anthracite export trade, Newport, to the east of the field, has the advantage of contact with that section of the field which gives promise of the greatest developments in the near future. In addition to this, Newport is advantageously situated on the river Usk, one of the deepest tidal rivers in the United Kingdom. It is also one of the nearest ports to the Midlands. Although the connection of Newport with shipping is of ancient date, it is during the last three-quarters of a century that as a shipping centre it has made important developments. The first dock at Newport was constructed towards the end of the year 1842. Sixteen years later this had to be enlarged in order to meet the growing demands of the port. The enlarged dock, known as the Town Dock, has a water area of eleven and a half acres. Within seven years of the first extension of this dock, that is, by the year 1865, it became necessary to provide further dock accommodation. It was probably owing to the views prevailing at that time as to the advantage of allowing private enterprise to take the initiative in such undertakings, that the Alexandra Docks Company was incorporated by Act of Parliament, to own and develop the docks at Newport. Thus the docks are owned and managed by private enterprise, but the harbour is under the authority of the Harbour Commissioners, whose powers are defined by Acts dated 1835 and 1869.

The Alexandra Company purchased the Town Dock, and constructed what is now the North Alexandra Dock, with a water area of nearly thirty acres. This dock was opened in the year 1875. The projectors of the new dock were far-sighted men, and built with an eye to the requirements of the future. The dock was constructed with an average depth of 30 feet, and an entrance measuring 350 feet long by 65 feet wide. Fifteen years later the facilities of the port were further increased by the opening of the South Alexandra Dock, which has a water area of 20 acres, and is joined to the North Alexandra Dock by a cutting 65 feet wide. This new dock was given an independent entrance from the Usk, and its dimensions were in proportion to the growing tonnage of steamships. Finally in the year 1904 it was decided to still further expand the dock area of the port, and as a result towards the end of the year 1907 one part of what is known as the South Dock Extension was opened to shipping. The Alexandra Docks system has a water area of nearly one hundred acres, and the newest portion has a depth of 33 feet, with a fine entrance to the river Usk, measuring 1000 feet long by 100 feet wide. The docks at Newport are now capable of accommodating the largest cargo steamers, and the equipment has been specially designed to give quick dispatch in handling goods of all descriptions.

Amount of Coal (*exclusive of bunkers*) exported from Newport in the undermentioned years:

Year.	Tons.
1880	1,032,572
1890	1,970,014
1900	2,779,013
1910	3,808,376
1912	4,036,254

CONCLUSION.—The most interesting part of the overseas trade of the United Kingdom undoubtedly centres at London, Liverpool, and Glasgow. At these ports the inward and outward cargoes are more diversified, and represent the typical products of a greater number of countries and climates than will be found at any other ports in the world. Great as are, however, London, Liverpool, and Glasgow, they by no means exhaust the important centres of shipping in the United Kingdom. In the foregoing pages the principal west-coast ports and London have been described in some little detail, but the east coast can boast of shipping centres of very remarkable interest. The Tyne and the Wear not only export about eighteen million tons of coal annually, a quantity rather greater than that exported from the Customs Port of Cardiff, but the shipbuilding yards on these two rivers construct nearly as many tons of shipping as the Clyde; whilst if all the north-east coast rivers from the Humber to the Tyne be taken together, the new tonnage constructed during the year 1913 exceeded that of the whole of Scotland by more than two hundred and eighty thousand tons. It is not, therefore, because these ports lack interest that they are not specially described, but because either they are principally shipbuilding and coal-exporting centres, or that they owe their development as trading centres to the fostering care of railway companies.

This section on some of the ports of the United

Kingdom may be brought to a fitting conclusion with an account of the connection between railway companies and port or harbour accommodation. The principal examples of railway enterprise in this direction are Southampton and the Humber ports, but during the sittings of the Committee on Railway Agreements and Amalgamations, in June 1910, a list containing the names of no less than seventy-two docks, harbours, piers, wharves, and quays either owned, leased, worked, or controlled by railway companies, was handed in as evidence. Some of the names in the list it is true, represented comparatively small enterprises, but others were of even more than national importance, and taken as a whole there was very substantial proof of the growing influence of the railway over foreign and coastwise trade—a point of no little importance in the future progress of this country.

Where a port is managed by a company organised for the purpose, and having no other either equal or subsidiary interest to serve, the enterprise has to be so managed that a dividend may be earned for the shareholders. In other words, it is an independent business undertaking, and as such, has to be managed on commercial principles. When, however, a port is managed by a public trust, rates and charges are fixed in order to produce a revenue which may be sufficient to cover working expenses and the interest and sinking-fund charges on any loans that may have been contracted. The management in this case may be rather more extravagant or liberal than that of a joint-stock company, but even so the Authority cannot continue permanently to fix rates at a point at which the expenses of working and loans are not covered.

When a municipality manages the docks at or near its area of responsibility, there is the ultimate possibility of calling upon the ratepayers to make good a deficiency between revenue and expenditure. And this may continue for many years, if the municipality can persuade a majority of the ratepayers that it is in the interests of the town to subsidise the port in order that by charging lower rates more business may result. In this respect a municipality somewhat resembles a railway company. The latter takes upon itself the responsibility of providing dock accommodation at its coast termini, not for the pleasure of owning docks, but as a business proposition. It need not necessarily, however, charge a fully paying rate for the accommodation provided. It will doubtless attempt to do so, but that is not a matter of primary importance with the managers. Their object in taking over the management of a harbour, or in constructing docks at a coast or river terminus, is either to increase the traffic of their whole system or to meet some form of competition that is threatening to affect a section of their traffic.

There are railway docks which are mainly important to the owning company on account of the amount of goods traffic focussing there: the Humber ports are typical of this. Other ports again have been developed under railway management because of the importance of the passenger traffic centering in them, of these Southampton is the outstanding example; although it should be noted that the value of imports and exports at Southampton during the past fourteen years has been subject to the extraordinary increase of about thirty million pounds annually. Many years ago Southampton as a port was on the down grade. Nor did it appear that there was a great possibility of stemming the falling tide of business. The town is far from the industrial centres of the country; it is seventy-nine miles from London, and about one-hundred and fifty miles from the Midlands. The tendency thirty or forty years ago was rather that ships and goods should get nearer to a given port, and the port must either itself be in an industrial district, or have facilities connecting it with populous manufacturing areas. Southampton practically lacked both of these advantages. In the year 1885, however, when the town authorities had definitely decided not to take over the docks, or make the developments necessary for the continued well-being of the port, the London and South Western Railway Company came to the assistance of the port, nor have the shareholders had cause to regret the step then taken. Southampton as a port has been kept up to date by the railway company at an expenditure of about five million pounds sterling. It now ranks sixth among the ports of the United Kingdom, and can not only accommodate the largest vessels afloat, but has given evidence of being prepared to carry out necessary developments should larger vessels be constructed.

The Humber ports, too, are a remarkable instance of railway enterprise. The docks at Hull, with a total water area of one hundred and eighty-six acres, are owned by two railway companies—the North Eastern and the Hull and Barnsley. The most recently constructed dock under railway ownership, is that at Immingham, on the Lincolnshire side, six miles up the Humber from Grimsby, and about twelve miles from Spurn Head. This dock is the property of the Great Central Railway Company, and those interested in its development predict for the harbour a very progressive future. The land area belonging to the Company at Immingham covers 1000 acres, and the water area of the dock is 45 acres, with a depth of water of from 30 to 35 feet. The dock was completed and opened to shipping in July 1912. This new dock has the advantage of being equipped with the most modern appliances for handling large quantities of goods. The expeditious loading of coal has been especially provided for: within a few months of the opening, twenty-eight hundred tons of coal were loaded into a steamer in just over seven hours. Being so near to the open sea, average-sized cargo steamers can enter or leave Immingham Docks at practically any state of the tide, by utilising the long entrance lock, when the channel level is lower than the water in the dock. There is also a pier at which large steamers can load bunker coal at any state of the tide without having to enter the dock at all.

At present (1914) a Royal Commission is enquiring into the working and organisation of English railways. In some quarters it is hoped that, as a result of the labours of this Commission, the railways may be nationalised. What effect that policy would have on both the internal and external transport of goods and passengers it is impossible to predict, but hitherto Englishmen have evidenced but slight talent for organising Government enterprise. Mr Gladstone used to say that the business of a Government is to govern, not to trade. Nor does experience show that the blending of the two functions usually leads to satisfactory results. When the progress made by our railways during the last three-quarters of a century is taken into account, a more natural development would appear to be towards unification of interest between themselves and the powerful combinations of shipping companies, in order that efficiency and economy might progress together. This policy might appear to be moving in the direction of monopoly, and the elimination of useful and healthy competition. It must be remembered, however, that methods of transportation are as yet in their infancy. And if the Government would adhere to its main function, and really govern there would be but little to fear from a well-organised monopoly. In theory—for in practice there is no precedent to which one can refer—it should be possible to obtain the maximum of advantage for all concerned, together with the minimum of waste, overlapping and friction, in a great, efficiently managed transport corporation owning railways, docks, and steamers, giving through facilities for passengers and goods. This, at present, imaginary corporation would need to be well regulated in the interests of the community, but this should be practicable in a democratic state, and would undoubtedly carry fewer dangers in its train than a policy of nationalisation, which, so far as actual experience goes, tends towards a condition of stagnation and inefficiency. The experience of France where harbours have been constructed by the State, is a sufficiently clear object lesson, so far as ports and harbours are concerned. Numerous small, unprogressive harbours would not satisfy the needs of British shipping, much as their construction by the State might, for a time, please certain sections of the electorate.

The shipping industry of this country has been built up by private initiative. Our docks and harbours owe much to the same progressive force. It is becoming the settled practice for our ports to be managed by a public authority representative to a considerable extent of the payers of dues. This is far removed from State ownership, nor would it appear that any development towards that end would be for the real benefit of British shipping.

APPENDICES

LIST OF APPENDICES

APPENDIX I

From "Lloyd's Calendar," 1913, Pages 570-72

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Record Sailing Ship Voyages

Mr Basil Lubbock has been kind enough to furnish the following particulars of Record Sailing Ship Passages. The passage is usually from pilot to pilot, but in a few cases from anchorage to anchorage. All vessels are British except those marked A, which are American; A, b, American built but British owned: and G, German. Under Record—D means days, H hours.

All the vessels mentioned were ship-rigged except where otherwise stated.

	Date	Vessel	Tons	Record D.	Record H.	Remarks
United Kingdom to Australia						
	1869	Thermopylæ, comp.	927	60	0	London to Melbourne (pilot to pilot)
	1877	Ben Voirlich, iron	1,474	61	0	Liverpool to Melbourne (dock to dock)
	1870	Thermopylæ, comp.	927	61	0	London to Melbourne
A b	1861	Marco Polo, wood	1,512	61	0	Liverpool to Melbourne
A b	1854	James Baines, wood	2,275	63	0	Liverpool to Melbourne
Australia to United Kingdom						
A b	1853	Lightning, wood	2,090	63	0	Melbourne to Liverpool
	1856	Heather Belle, wood	479	64	0	Melbourne to Liverpool
	1885	Cutty Sark, comp.	963	67	0	Sydney to Lizard
	1869	Patriarch, iron	1,339	68	0	Sydney to Lizard

United Kingdom to India							
		186–	Alnwick Castle, wood	1,087	67	0	Channel to Sandheads
		1863	The Tweed, wood	1,745	77	0	London to Bombay (with Persian Gulf Telegraph Cable on board)
		1863	Hotspur, wood	1,050	79	0	Lizard to Madras
A	b	1857	Lightning, wood	2,090	87	0	Portsmouth to Calcutta
United Kingdom to China							
		1866-7	Ariel, comp.	853	80	0	London to Hong Kong (by long Eastern route and against N.E. monsoon)
		1857	Northfleet, wood	951	88	0	Woolwich to Hong Kong
		1858	Northfleet, wood	951	88	7	Woolwich to Hong Kong
United Kingdom to United States							
A		1855	Mary Whitridge, wood	987	14	9	Liverpool to Baltimore
A		1860	Andrew Jackson, wood	1,676	15	0	Rock Light to Sandy Hook
Europe to West Coast, South America							
G		1903	Preussen, steel 5-mast	5,081	57	0	Hambourg to Iquique
		1904	Eudora, 4-mast barque	1,991	57	16	Eddystone to Coquimbo
G		1904	Preussen, steel 5-mast	5,081	62	0	Hambourg to Iquique
G		1904	Preussen, steel 5-mast	5,081	62	0	Hambourg to Iquique
G		1897	Potosi, steel 5-mast barque	4,026	64	0	Hambourg to Valparaiso
G		1901	Potosi, steel 5-mast barque	4,026	66	0	Hambourg to Valparaiso
		1903	Tamar, steel	2,112	68	0	Dover to Callao

Date			Vessel	Tons	Record D.	Record H.	Remarks
United States to United Kingdom							
A	b	1854	James Baines, wood	2,275	12	6	Boston to Liverpool
A		..	Adelaide, wood	..	12	8	New York to Liverpool
A	b	1854	Red Jacket, wood	2,035	13	1	New York to Liverpool
A		1853	Typhoon, wood	1,610	13	6	Portsmouth, N.H., to Liverpool (dock to dock)
A		..	Fidelia, wood	..	13	7	New York to N.W. Lightship
A		1859	Dreadnought, wood	1,413	13	8	New York to Liverpool
A		1854	Dreadnought, wood	1,413	13	11	New York to Liverpool
A		1853	Sovereign of the Seas, wood	2,421	13	19	New York to Liverpool
					5	17	From the Banks
A	b	1854	Lightning, wood	2,090	13	19½	Boston to Liverpool (best run in 24 hours, 436 nautical miles)
United States to San Francisco							
A		1851	Flying Cloud, wood	1,793	89	0	From New York
A		1854	Flying Cloud, wood	1,793	89	0	From New York
A		1860	Andrew Jackson, wood	1,676	89	0	From New York
A		1852	Sword Fish, wood	1,036	90	0	From New York
A		1853	Flying Fish, wood	1,505	92	0	From New York
A		1853	John Gilpin, wood	1,089	93	0	From New York
A		1856	Sweepstakes, wood	1,735	94	0	From New York
A		1851	Surprise, wood	1,361	96	0	From New York
A		1854	Romance of the Seas, wood	1,782	96	0	From Boston
San Francisco to United States							
A		1854	Comet, wood	1,836	76	0	To New York
A		1853	Northern Light, wood	1,021	76	5	To Boston Light

A	1853	Contest, wood	1,150	80	0	To New York
A	1898	Shenandoah, wood 4-mast barque	3,154	95	0	To New York

CHINA TO UNITED STATES

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A	1847-8	Sea Witch, wood . . .	890	78	0	From Canton
A	1845	Natchey, wood	..	78	6	Macao to Boston
A	1848-9	Sea Witch, wood . . .	890	79	0	From Canton
A	1847	Sea Witch, wood . . .	890	81	0	From Canton
A	1846	Natchey, wood	..	83	0	
A	1852	N.B. Palmer, wood . . .	1,490	84	0	From Canton

CHINA TO UNITED KINGDOM

	1869	Sir Lancelot, comp. . . .	886	89	0	From Foochow
A	1852	Witch of the Wave, wood . .	1,200	90	0	From Whampoa
A	1855	Nightingale, wood . . .	1,066	91	0	From Shanghai
	1869	Thermopylae, comp. . . .	927	91	0	From Foochow
	1871	Titania, comp.	879	93	0	From Foochow
A	1850	Oriental, wood	1,003	97	0	From Grand Ladrone
	1868	Spindrift, comp. . . .	899	97	0	From Foochow
	1868	Ariel, comp.	853	97	0	From Foochow
	1870	Lahloo, comp.	799	97	0	From Foochow
	1869	Titania, comp.	879	98	0	From Shanghai
	1868	Sir Lancelot, comp. . . .	886	98	0	From Foochow
	1866	Ariel, comp.	853	99	0	From Foochow

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	Date	Vessel	Tons	Record D.	Record H.	Remarks
China to United Kingdom—*continued*						
	1866	Taeping, comp.	767	99	0	From Foochow
	1866	Serica, wood	708	99	0	From Foochow
	1867	Sir Lancelot, comp.	886	99	0	From Shanghai
Miscellaneous						
	1898	Drumalis, iron	..	14	0	Cape Town to Newcastle N.S.W.
	1900	Audorinha, steel 4-mast barque	3,481	14½	0	Cape Town to Newcastle N.S.W.
A	1855	Swordfish, wood	1,036	32	9	San Francisco to Shanghai
	1896	Wendur, iron 4-mast barque	2,046	29	13	Newcastle, N.S.W. to Valparaiso
	1896	Loch Torridon, iron 4-mast barque	2,081	30	2	Newcastle, N.S.W. to Valparaiso
	..	Eurydice, iron	1,152	19	0	Yokohama to Port Townsend
	1870	Thermopylae, comp	927	28	0	Newcastle, N.S.W. to Shanghai
A	1853	Hornet, wood	1,426	34	0	San Francisco to Callao
	1897	Westgate, iron	1,921	80	0	New York to Sydney
	1897	Benares, iron 4-mast barque	1,721	40	0	Table Bay to New York
	1897	Foyledale	..	25	0	Hiogo to Tacoma
	1897	Selkirkshire, iron barque	1,237	21	0	Yokohama to Astoria
	1899	Puritan, steel 4-mast barque	2,361	15	0	New York to Butt of Lewis
	1894	Eudora, steel 4-mast barque	1,991	99	0	Swansea to San Francisco
	1895	Siren, iron	1,478	25	0	Table Bay to Sydney
Old India Passages						
	1820	Lord Wellington, H.E.I.C.	..	82	0	London to Calcutta
	1826	Thomas Coutts, H.E.I.C.	..	82	0	London to Bombay
	183–	Castle Huntley, H.E.I.C.	..	77	0	Torbay to Bombay
	183–	Earl of Balcarres, H.E.I.C.	..	79	0	London to Bombay
	1836	Parkfield	..	75	0	Liverpool to Bombay

	—	Seringapatam, Green's	.	.	..	85	0	London to Bombay
A	1822	The George of Salem [1]	.	.	..	89	0	Salem to Calcutta
A	1823	The George of Salem [1]	.	.	..	96	0	Salem to Calcutta
A	1831	The George of Salem [1]	.	.	..	93	0	Calcutta to Salem
A	1830	The George of Salem [1]	.	.	..	95	0	Calcutta to Salem
A	1821	The George of Salem [1]	.	.	..	95	0	Calcutta to Salem

[1] This vessel made 21 successful voyages to Calcutta and was known all over the world as "The Salem Frigate."

FASTEST DAY'S RUN

The *Lightning*, 436 Nautical Miles

March 1, 1854. The *Lightning* (Black Ball Australian Liner) when crossing from Boston to Liverpool on her maiden voyage. Her position on February 28th was, Lat. 52.38 N., Long. 22.45 W. Log entry reads as follows :—" Wind, south. Strong gales ; bore away for the North Channel ; carried away the foretop-sail and lost jib ; hove the log several times and found the ship going through the water at the rate of 18 or 18½ knots ; lee rail under water and rigging slack.

APPENDIX II

Total Net Tonnage of British and Foreign Vessels, Sailing and Steam, Entered and Cleared at Ports in the United Kingdom from and to Foreign Countries and British Possessions.

(Compiled from the Statistical Abstracts for the United Kingdom.)

	1855	1860	1870	1880	1890	1900	1910	1911	1913
British— Steam .	..	..	13,341,058	30,976,037	49,023,775	61,755,995	78,926,015	81,101,068	..
Sailing .	..	..	11,731,122	10,372,947	4,949,337	2,408,183	889,015	784,386	..
Total .	10,919,732	13,914,923	25,072,180	41,348,984	53,973,112	64,164,178	79,815,030	81,885,454	..
Foreign— Steam .	..	..	1,731,273	6,237,905	12,661,234	29,996,788	51,205,189	53,997,891	..
Sailing .	..	..	9,836,729	11,149,174	7,649,523	5,816,079	3,010,039	3,025,996	..
Total .	7,569,738	10,774,369	11,568,002	17,387,079	20,310,757	35,812,867	54,215,228	57,023,887	..
Total— British and Foreign .	18,489,470	24,689,292	36,640,182	58,736,063	74,283,869	99,977,045	134,030,258	138,909,341	..
Percentage of British to total .	59.05	56.3	68.4	70.4	72.6	64.1	59.5	58.9	..
Or reducing the tonnage to terms of steam tonnage, reckoning one ton steamer equal to four tons sailing ship		British	16,273,838	33,569,273	50,261,109	62,358,041	79,148,268	81,297,164	..
		Foreign	4,190,455	9,025,198	14,573,615	31,450,808	51,957,698	54,754,390	..
		Total .	20,464,293	42,594,469	64,834,724	93,808,849	131,105,966	136,051,554	..
The percentage would be		. .	79.5	78.8	77.5	66.4	60.72	59.77	..

APPENDIX III

TABLE SHOWING THE DEVELOPMENT IN THE IMPORTATION OF FROZEN MUTTON INTO THE *United Kingdom* FROM AUSTRALIA, NEW ZEALAND, AND SOUTH AMERICA FROM 1880 TO 1893.

(Compiled from official returns.)

CARCASES

Year	Australia	New Zealand	Falkland Islands	River Plate	Total
1880	400	..	..	..	400
1881	17,275	..	..	..	17,275
1882	57,256	8,839	..	..	66,095
1883	63,733	120,893	..	17,165	201,791
1886	66,960	655,888	30,000	434,699	1,187,547
1890	207,984	1,533,393	10,168	1,196,531	2,948,076
1893	605,692	1,893,604	16,425	1,373,723	3,889,444

TOTAL EXPORTS OF FROZEN MEAT FROM NEW ZEALAND. 1882-1911.

Year	lbs.	Year	lbs.
1882	1,707,328	1900	206,621,072
1883	9,853,200	1903	266,408,800
1886	38,758,160	1905	189,356,608
1890	100,934,756	1910	297,269,952
1893	100,262,453	1911	252,063,280
1895	127,018,864		

EXPORT OF FROZEN MUTTON FROM ARGENTINA. 1895–1911.

Year	Tons.	Year	Tons.
1895	41,882	1910	75,102
1900	56,412	1911	85,916
1905	78,351		

APPENDIX IV

Statistics Showing the Development of the Suez Canal Company from the Date of Opening.

(The figures in this table were checked at the office of the Suez Canal Company.)

Year	No. of Vessels	Gross Tonnage	Net Tonnage Suez Canal Measurement	Average net Tonnage	Receipts General	Dividends Net	Price of Stock	Percentage of British Tonnage
						Frs.		
1870	486	654,914	436,609	898	£206,373	23.500	about 272 frs.	66.35
1875	1,494	2,940,708	2,009,984	1,345	£553,785	24.920	[1]£22⅛–£33¼	74.18
1880	2,026	4,344,520	3,057,422	1,509	£1,593,620	44.754	[1]£28⅞–£49¼	79.97
1885	3,624	8,985,412	6,335,753	1,748	£2,488,298	80.642	[1]£71⅛–£88¾	76.77
1890	3,389	9,749,129	6,890,094	2,033	£2,679,360	86.751	[2]£93⅜	77.37
1895	3,434	11,833,637	8,448,383	2,460	£3,124,149	92.500	[2]£129	71.8
1900	3,441	13,699,238	9,738,152	2,830	£3,624,944	108	[2]£140¼	57.6
1905	4,116	18,310,442	13,134,106	3,191	£4,554,672	141	[2]£177	63.6
1910	4,533	23,054,901	16,581,898	3,658	£5,217,462	151	[1]£196⅛–£219	62.9
1912	5,373	28,008,945	20,275,120	3,774	£5,596,905	165	[1]£225–£262	63.4

[1] Highest and Lowest prices for the year. [2] Average price for the year.
The shares were first quoted on the London Stock Exchange on February 23rd 1875.

Depth of Water in the Suez Canal

On January 5th 1914, the Company announced that the maximum draught of water authorised in the Canal has been increased to 29 feet.

The increasing draught of water authorised since the opening of the Canal is as under :—

Year	feet	inches	Year	feet	inches	Year	feet
1870	24	4	1902	26	4	1908	28
1890	25	4	1906	27		1914	29

APPENDIX V

Copy of a Suez Canal Account, 1913.

Messrs the Captain and Owners
of the S.S. "X. Y. Z."

In Account with The English Coaling Company, Ltd.

Homeward.

Dr To Canal dues on Tons 5610.58 @ Fcs. 6.75 Fcs.	37,871	42	
,, Canal dues on passengers			
,, Pilotage (night)	25		
,, Light dues on Tons Turk 4922.22 £ E 28.611	741	69	
,, Bill of health and Sanitary fees 27.74 Night *pratique* clearance	27	74	
,, Customs and Port clearance	4	67	
,, Mooring and unmooring ship....Hire of Rats' screens	15		
,, Mooring boat through Canal	87	50	
,, Telegrams to and from Suez 7.50 London 3.77	11	27	
,, Shipchandler's A/c........Water A/c	920	97	
,, Cash advanced to Captain	505	50	
,, Services of Steam despatch launch in Suez Roads, sundries, postage, boat hires, clearance here and at Suez	65		
,, 25 Trimmers @ 5 fcs. 125. Gratuity to Pilots 50	175		
,, Consular fees, French	20		
,, Doctor's A/c........Hospital fund			
,, Hire of Electric Light	202	20	
,, Suez A/c....B/health and Sanitary fees	55	74	
,, ,, ...Night pratique and attendance	52	46	
,, ,, ...Telegram to London	3	77	
,, Police Guards	17	50	
Fcs.	40,802	43	
@ Ex. of Fcs. 25.03 per £ stg. £1630.210 809 Tons Cardiff Coals @ 32/6 £1314.12 £	2,944	15	4

APPENDIX VI

Number and Tonnage of Ships Constructed by British Shipbuilding Yards during the Years 1911 and 1912.

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		No. of Ships	Tons Gross 1912	Tons Gross 1911
1	Swan, Hunter & Wigham Richardson, Wallsend	21	126,152	112,758
2	Wm Doxford & Sons, Sunderland	18	92,481	84,471
3	Workman, Clark & Co., Belfast	10	85,391	66,399
4	Wm. Gray & Co., West Hartlepool	20	80,886	73,500
5	Harland & Wolff, Belfast	7	77,591	118,209
6	Cammell, Laird & Co., Birkenhead	11	77,032	27,276
7	Russell & Co., Port Glasgow	13	71,224	72,229
8	Palmer's Shipbuilding & Iron Co., Jarrow	7	58.902	39,342
9	Scotts' Shipbuilding & Engineering Co., Greenock	9	58,313	31,478
10	Northumberland Shipbuilding Co., Howdon	12	53,050	57,829
11	Vickers, Ltd., Barrow	4	52,860	49,960
12	C. Connell & Co., Scotstoun	8	45,314	37,850
13	Ropner & Sons, Stockton	10	44,473	28,570
14	Irvine's Shipbuilding Co., West Hartlepool	10	44,013	63,478
15	Barclay, Curle & Co., Whiteinch	8	43,412	40,134
16	Sir W. G. Armstrong, Whitworth & Co., Newcastle	8	41,535	74,124
17	Wm. Hamilton & Co., Port Glasgow	7	40,029	26,101
18	J. L. Thompson & Sons, Sunderland	8	37,749	41,584
19	R. & W. Hawthorn, Leslie & Co., Hebburn	7	37,460	39,594
20	Fairfield Shipbuilding and Engineering Co., Govan	4	36,626	40,107

		No. of Ships	Tons Gross 1912	Tons Gross 1911
21	Caird & Co., Greenock	4	35,586	23,477
22	Wm. Denny & Bros., Dumbarton .	7	33,925	40,446
23	Richardson, Duck & Co., Stockton .	8	33,703	32,417
24	Short Bros., Sunderland . . .	6	31,431	26,589
25	A Stephen & Sons, Linthouse . .	5	29,611	38,159
26	D. & W. Henderson & Co., Partick .	5	27,766	29,247
27	J. Readhead & Sons, South Shields .	6	26,527	32,911
28	A. McMillan & Son, Dumbarton . .	6	26,141	19,901
29	Craig, Taylor & Co., Stockton . .	6	26,037	31,793
30	Greenock & Grangemouth Dockyard Co., Greenock and Grangemouth . .	10	23,586	11,543
31	Sir James Laing & Sons, Sunderland .	5	23,538	17,786
32	Sir Raylton Dixon & Co., Middlesbrough	8	23,467	36,782
33	Sunderland Shipbuilding Co., Sunderland	7	22,931	19,469
34	Bartram & Sons, Sunderland . .	5	22,855	21,083
35	John Brown & Co., Clydebank . .	6	22,782	65,613
36	Earle's Shipbuilding & Engineering Co., Hull	12	22,198	18,742
37	Wm. Beardmore & Co., Dalmuir . .	3	21,500	31,400
38	J. Priestman & Co., Sunderland . .	5	19,439	14,631
39	R. Thompson & Sons, Sunderland .	6	19,221	14,733
40	J. Blumer & Co., Sunderland . .	5	15,973	14,701
41	Robt. Duncan & Co., Port Glasgow .	4	15,059	4,965
42	Ailsa Shipbuilding Co., Troon and Ayr .	9	14,035	6,562
43	W. Pickersgill & Sons, Sunderland .	4	13,783	11,262
44	Napier & Miller, Old Kilpatrick . .	7	13,782	14,004
45	Wm. Dobson & Co., Newcastle . .	4	12,230	21,227
46	Blyth Shipbuilding Co., Blyth . .	4	12,215	9,258
47	London & Glasgow Engineering and Iron Shipbuilding Co., Glasgow . .	3	12,210	10,800
48	Caledon Shipbuilding & Engineering Co., Dundee	8	11,704	11,763
49	Tyne Iron Shipbuilding Co., Willington Quay	3	11,537	19,459
50	Osbourne, Graham & Co., Sunderland .	6	11,408	10,001
51	Mackie & Thomson, Govan . . .	15	11,320	5,549
52	Wood, Skinner & Co., Bill Quay . .	5	10,945	15,118
53	Smith's Dock Co., Middlesbrough .	30	10,029	11,983
54	Fleming & Ferguson, Paisley . .	12	9,300	6,700

		No. of Ships	Tons Gross 1912	Tons Gross 1911
55	Clyde Shipbuilding & Engineering Co., Port Glasgow	5	8,831	12,376
56	S. P. Austin & Son, Sunderland	4	8,420	10,047
57	Cochrane & Sons, Selby	36	8,242	8,833
58	Goole & Dundee Shipbuilding Cos., Goole and Dundee	27	8,110	8,905
59	Wm. Simons & Co., Renfrew	10	7,643	6,100
60	Campbeltown Shipbuilding Co., Campbeltown	4	7,574	7,400
61	Lobnitz & Co., Renfrew	14	7,100	6,565
62	Dunlop, Bremner & Co., Port Glasgow	4	7,025	1,156
63	Cook, Welton and Gemmell, Beverley	27	7,012	7,521
64	W. Harkess & Son, Middlesbrough	9	6,630	7,117
65	Rennié-Forrestt Shipbuilding Co., Wivenhoe	34	6,104	..
66	Mackay Bros., Alloa	3	5,331	705
67	Ramage & Ferguson, Leith	5	5,202	5,164
68	Hall, Russell & Co., Aberdeen	19	5,196	5,225
69	J. S. White & Co., Cowes	..	4,476	2,627
70	John Crown & Sons, Sunderland	3	4,267	6,264
71	A. W. Robertson & Co., London	23	4,223	2,774
72	J. I. Thornycroft & Co., Southampton	11	3,100	4,247
73	Bow, McLachlan & Co., Paisley	11	3,039	3,409
74	Ferguson Bros., Port Glasgow	4	2,980	6,152
75	R. Williamson & Son, Workington	4	2,823	1,637
76	Alley & Maclellan, Glasgow	32	2,750	2,630
77	John Duthie Torry Shipbuilding Co., Aberdeen	17	2,609	2,751
78	Scott & Sons, Bowling	8	2,600	1,280
79	Murdoch & Murray, Port Glasgow	7	2,521	998
80	J. P. Rennoldson & Sons, South Shields	8	2,230	820
81	C. H. Walker & Co., Sudbrook	20	2,131	1,573
82	J. Fullerton & Co., Paisley	4	2,121	2,140
83	Hawthorns & Co., Leith	6	1,815	..
84	Alex. Hall & Co., Aberdeen	11	1,803	1,650
85	Ardrossan Shipbuilding Co., Ardrossan	9	1,785	1,533
86	Dublin Dockyard Co., Dublin	4	1,641	1,976
87	A. & J. Inglis, Glasgow	2	1,333	7,371
88	Edwards & Co., Millwall	23	1,311	1,072

		No. of Ships	Tons Gross 1912	Tons Gross 1911
89	Joseph Scarr & Son, Beverley . .	8	1,145	1,860
90	Crabtree & Co., Great Yarmouth .	6	1,062	..
91	J. T. Eltringham & Co., South Shields	5	1,029	1,972
92	Geo. Brown & Co., Greenock . .	6	1,010	2,524
93	Yarrow & Co., Glasgow . . .	7	1,007	1,681
94	Henry Scarr, Hessle	7	820	1,470
95	Beeching Bros., Yarmouth . .	8	800	..
96	Hepple & Co., South Shields . .	7	758	449
97	Fellows & Co., Great Yarmouth . .	6	548	..
98	P. McGregor & Sons, Kirkintilloch .	7	435	..
99	D. M. Cumming, Glasgow . . .	7	325	..
100	Ritchie, Graham & Milne, Whiteinch .	5	315	..
101	John Cran & Co., Leith . . .	5	292	602
102	Simpson, Strickland & Co., Dartmouth	31	257	108

The following is a summary of the engineering returns for the same two years :—

	1912 i.h.p.	1911 i.h.p.
John Brown & Co., Clydebank	178,500	104,550
Vickers, Limited, Barrow	136,750	121,000
North Eastern Marine Engineering Company, Wallsend and Sunderland	129,125	98,105
Wallsend Slipway, and Engineering Company, Wallsend	123,000	72,800
Cammell, Laird & Co., Birkenhead . . .	101,350	122,249
Parsons Marine Steam Turbine Company, Wallsend	96,800	68,500
R. and W. Hawthorn, Leslie and Co., Newcastle .	82,850	132,200
Blair & Co., Stockton	76,850	71,150
Richardsons, Westgarth & Co., Middlesbrough and Sunderland (marine)	67,000	63,630
Wm. Beardmore & Co., Dalmuir	60,000	49,000
Denny & Co., Dumbarton	58,400	72,650
J. S. White & Co., E. Cowes	56,476	37,195
Fairfield Shipbuilding & Engineering Company, Govan	55,200	67,250
Workman, Clark & Co., Belfast	53,400	51,800
David Rowan & Co., Glasgow	52,700	58,050

	1912 i.h.p.	1911 i.h.p.
Scotts' Shipbuilding & Engineering Company, Greenock	51,550	22,100
Central Marine Engine Works, West Hartlepool .	46,510	41,360
Dunsmuir & Jackson, Glasgow	41,650	40,500
Harland & Wolff, Belfast	39,300	96,916
J. Dickinson & Sons, Sunderland	38,940	38,820
Geo. Clark, Sunderland	35,800	47,316
Wm. Doxford & Sons, Sunderland	35,500	43,450
Earle's Shipbuilding & Engineering Company, Hull	34,260	26,920
Barclay, Curle & Co., Whiteinch	33,850	32,750
J. I. Thornycroft & Co., Southampton . . .	33,350	49,530
London and Glasgow Engineering Company, Glasgow	33,100	26,000
Alex. Stephen & Sons, Linthouse	31,920	40,000
J. G. Kincaid & Co., Greenock	30,250	15,840
Caird & Co., ...	27,000	..
Swan, Hunter & Wigham Richardson, Wallsend .	26,000	91,100
Rankin & Blackmore, Greenock	25,000	18,600
Palmer's Shipbuilding & Iron Company, Jarrow .	19,130	27,000
C. D. Holmes & Co., Hull	17,170	12,910
Ross & Duncan, Glasgow	15,420	15,180
J. Readhead & Sons, South Shields	14,300	17,050
D. & W. Henderson & Co., Partick	14,255	29,835
Ailsa Shipbuilding Company, Troon and Ayr .	13,150	..
Fleming & Ferguson, Paisley	12,200	12,500
Lobnitz & Co., Renfrew	12,100	9,450
Wm. Simons & Co., Renfrew	12,080	11,095
Smith's Dock Company, Middlesbrough . .	12,000	..
Bow, McLachlan & Co., Paisley	11,440	9,350
MacColl & Pollock, Sunderland	11,440	5,230
Clyde Shipbuilding & Engineering Company, Port Glasgow	11,100	12,950
Amos & Smith, Hull	11,020	13,440
Shields Engineering & Dry Docks Company, N. Shields	10,290	12,535
Muir & Houston, Glasgow	9,930	3,840
Caledon Shipbuilding & Engineering Co., Dundee .	9,400	14,200
McKie & Baxter, Glasgow	9,115	..
Hall, Russel & Co., Aberdeen	8,925	10,010
G. T. Grey, South Shields	7,730	4,055

	1912 i.h.p.	1911 i.h.p.
W. V. V. Lidgerwood, Coatbridge	6,860	14,605
Ramage & Ferguson, Leith	6,250	6,500
Ferguson Bros., Port Glasgow	5,320	10,000
Crabtree & Co., Great Yarmouth . . .	5,105	..
A. & J. Inglis, Glasgow	4,100	18,259
J. P. Rennoldson & Sons, South Shields . .	4,086	2,300
Alex Hall & Co., Aberdeen	3,900	3,550
Aitchison, Blair & Co., Clydebank . . .	3,850	4,560
Campbell & Calderwood, Paisley . . .	3,550	3,110
Dunlop Bremner & Co., Port Glasgow . .	3,250	..
Simpson, Strickland & Co., Dartmouth . .	1,958	2,497
Hepple & Co., South Shields	1,550	1,398
MacColl & Co., Belfast	750	1,400
John Cran & Co., Leith	250	2,000
Menzies & Co., Leith	180	555
Alley & Maclellan, Glasgow	60	765

APPENDIX VII

EARNINGS OF SHIPBUILDING COMPANIES. 1912.

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THE results of the working during the past year of the shipbuilding and engineering companies whose accounts are published are given below. As compared with a year ago, the figures show a slight improvement as regards the percentage of dividend paid, the rate this year being 6.98 per cent. as compared with 6.11 per cent. last year, but it should be borne in mind that the accounts of three companies which last year made a loss on working and were unable to pay a dividend are this year omitted. The three companies are the London and Glasgow Shipbuilding Company, which last year made a loss of £2,636; this Company was purchased by Messrs Harland and Wolff in February last, paying £9 3s. for the £9 shares, which were quoted in the market at the time at £6. The Thames Ironworks, which lost £3,458 last year, is in the hands of a receiver. Messrs Richardsons, Westgarth and Co., the third company referred to, which lost £6,475 last year, have not yet issued their accounts. Four of the fifteen companies in the list have been unable to secure a profit after providing for interest, etc., and it is to be feared that a large number of shipbuilding and engineering establishments, whose accounts are not published, are in the same condition. In shipbuilding pure and simple the larger portion of the shipbuilders in this country have carried on their business this year at a loss. One well-known concern on the Clyde had made a loss on its working up to the middle of the year, when a spec. boat on the stocks was sold at a very handsome price, which put the balance on the right side. Another Clyde firm has not made a penny profit in shipbuilding for four years. The shipbuilding concerns in the country which have made large profits have obtained these from other branches than shipbuilding—in fact, it is stated on very good authority that two or three of the large concerns would be infinitely better off at the present time if they had not a shipbuilding branch in their business.

One well-known shipbuilder maintains that if all the accounts of the shipbuilding trade could be published, it would show a disastrous state of affairs, the action of the men in malingering, etc., making it impossible to carry out the contracts taken a year or so ago at anything but a heavy loss :—

Name of Company	Capital	Loans, debts, etc.	Profit for year	Dividend	Per Cent.
	£	£	£	£	
Swan, Hunter and Wigham Richardson	1,173,577	624,762	151,667	74,547	6·35
Wm. Doxford & Sons	450,000	229,500	81,115	27,500	6·11
Cammell, Laird & Co.	2,372,895	2,229,733	120,961	86,531	3·64
Vickers	5,200,000	3,933,406	641,685	440,788	8·47
Armstrong, Whitworth & Co.	4,210,000	3,197,547	507,826	441,250	10·48
Wm. Beardmore & Co.	2,000,000	2,096,425	188,131	100,000	5·00
J. I. Thornycroft & Co.	346,500	313,795	54,795	37,125	10·71
J. Brown & Co.	3,423,000	2,322,243	227,109	216,725	6·33
S. P. Austin & Co.	135,000	75,896	15,253	10,000	7·40
D. and W. Henderson & Co.	525,000	147,531	—20,912	7,500	1·42
Sir Jas. Laing & Sons	138,786	194,078	—14,642	*nil*	—
R. & W. Hawthorn, Leslie & Co.	462,700	177,413	63,096	46,270	10·00
Smith's Dock Co.	600,000	426,470	82,413	50,000	8·03
Palmer's Shipbuilding Co.	698,564	827,059	—31,580	*nil*	—
Fairfield Shipbuilding Co.	500,000	1,152,912	—45,123	15,000	3·00
Totals	22,236,022	17,948,770	2,224,794	1,553,236	6·98

Working of some Cargo

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Name of Company	Paid-up Capital	Debentures, Loans, Bills Payable, etc.	Book Value of Steamers	Sundry Debtors, Bills Receivable, Investments and Cash
	£	£	£	£
Adam Steamship Co. .	62,500	20,964	81,664	16,639
Angus Shipping Co. .	22,783	1,494	22,217	11,363
Ariadne Steamship Co. .	25,000	16,915	49,030	6,186
Armenia S.S. Co. . .	18,000	3,051	18,000	1,370
Auchen S.S. Co. . .	74,550	89,171	146,000	18,169
Blake S.S. Co. . .	17,390	14,351	37,915	—
Bradford S.S. Co. . .	66,840	14,942	77,204	5,938
Britain Steamship Co. .	463,960	36,151	582,000	50,974
Canterbury S.S. Co. .	20,850	16,344	40,862	2,841
Celtic Shipping Co. .	25,000	37,028	63,336	1,850
Century Shipping Co. .	207,630	137,491	400,969	65,319
Clutha Shipping Co. .	47,250	17,749	63,118	9,828
Conway Shipping Co. .	54,600	2,050	55,019	1,078
Cornhill Shipping Co. .	30,500	166,228	197,443	22,426
Eftikhia S.S. Co. . .	35,000	37,108	73,490	2,052
Empire Transport Co. .	225,000	415,623	335,000	318,369
Court Line . . .	100,000	78,965	144,477	39,230
Cuban S.S. Co. . .	94,500	72,473	136,351	36,804
Darwin S.S. Co. . .	10,208	9,684	19,500	3,251
Dene S.S. Co. . .	67,380	27,108	81,000	15,436
Dowgate S.S. Co. . .	150,300	64,724	209,495	34,054
Dunedin S.S. Co. . .	32,275	33,436	90,000	15,219
Eastern and Australian S.S. Co.	97,840	93,472	184,452	20,584
Ericsson Shipping Co. .	15,000	32,462	45,393	8,180
Eskside Shipping Co. .	62,570	31,894	97,756	7,169
Fargrove S.N. Co. . .	222,920	46,521	242,000	63,515
Field Line (Cardiff) .	54,360	99,344	140,604	41,769
Field S.S. Co. . .	48,510	13,538	56,790	9,983
Glasgow King S.S. Co. .	55,070	28,395	99,921	21,115
Goole and West Riding S.S. Co.	20,000	17,634	36,000	8,253
Glenroy S.S. Co. . .	32,000	646	32,000	8,980
Grindon Hall S.S. Co. .	20,000	—	20,000	1,749
Carry forward .	2,479,786	1,676,956	3,879,006	869,693

* Depreciation is taken at 5 per cent. on original cost or 6 per

DIX VIII

Ship Companies in 1912.

of the Editor of *Fairplay*.

No. of Vessels	Tons. Gross	Profit or Loss from Voyages	Dividend on Capital	Per cent	Transferred to Depreciation, etc.	Depreciation at 5 Per cent *
		£	£		£	£
4	14,805	12,710	6,250	10	5,914	4,900
2	5,297	8,760	5,554	25	3,000	1,333
2	6,585	12,830	2,500	10	7,710	2,942
1	2,330	1,117	*nil*	—	*nil*	900
4	15,396	12,394	*nil*	—	*nil*	8,773
1	3,740	3,106	559	3·21	1,000	1,896
2	8,390	†12,887	†9,625	14·40	*nil*	3,860
19	69,124	67,778	23,198	5	23,657	34,920
1	4,209	4,520	1,303	6.25	6,000	2,043
1	4,122	5,006	625	2½	*nil*	3,167
10	43,812	48,508	15,572	7½	32,850	20,049
2	8,699	15,677	4,200	8.88	10,000	4,056
1	4,003	8,094	5,460	10	1,000	2,751
6	20,578	20,137	*nil*	—	10,213	9,872
2	6,676	7,133	1,750	5	2,000	4,409
8	34,906	75,590	11,250	5	40,000	16,750
4	17,600	23,052	7,000	7	8,971	9,207
5	15,837	26,380	4,725	5	16,848	11,217
1	2,787	3,945	2,552	25	1,250	1,170
3	10,852	18,671	1,685	2½	10,448	5,487
6	21,142	21,680	7,515	5	10,000	13,170
3	12,291	16,375	3,227	10	9,000	5,940
4	16,009	19,784	*nil*	—	14,700	14,700
2	3,806	8,089	1,500	10	4,393	2,723
3	10,483	16,746	4,693	7½	9,050	5,997
10	31,331	53,112	16,719	7½	28,750	16,065
5	11,840	18,166	*nil*	—	5,000	8,436
2	6,133	7,879	2,911	6	3,000	3,587
3	11,556	23,710	5,507	10	16,700	4,996
4	3,657	4,779	1,200	6	2,800	2,300
1	2,755	3,526	1,280	4	500	1,600
1	3,713	10,358	2,400	12	7,563	1,675
123	434,464	592,499	150,760	—	292,317	230,891

cent. on written-down value. † At the rate of.

2 P

Name of Company	Paid-up Capital	Debentures, Loans, Bills Payable, etc.	Book Value of Steamers	Sundry Debtors, Bills Receivable, Investments and Cash
	£	£	£	£
Brought forward .	2,479,786	1,676,956	3,879,006	869,693
Gulf Line . . .	233,906	222,209	462,746	22,049
Haigh Hall S.S. Co. .	30,000	3,500	32,500	2,283
Hain S.S. Co. . .	499,570	278,223	805,183	124,675
Harrowing S.S. Co. .	137,290	64,958	186,289	13,362
Hathor S.S. Co. . .	27,000	15,341	35,771	10,796
Haws S.S. Co. . .	21,000	7,461	24,900	1,981
Hindustan S. Shipping Co.	67,095	47,979	109,981	18,787
International Line S.S. Co.	134,975	41,410	190,904	17,415
Irish Shipowners' Co. .	257,239	95,848	350,000	17,358
Isles S. Shipping Co. .	54,885	26,720	87,151	10,832
Jones, W. and C. T., S.S. Co.	280,000	37,697	249,863	89,993
King Line	200,000	152,344	333,550	38,498
Lancashire Shipping Co.	160,000	83,418	298,562	33,579
Langbank S.S. Co. .	28,000	2,948	28,000	5,263
Leander S.S. Co. . .	19,570	22,005	53,000	4,054
London Exchange S.S. Co.	32,190	18,530	41,500	3,372
London and Northern S.S. Co.	286,875	144,303	513,761	31,628
Lydford S.S. Co. . .	16,000	21,738	38,111	1,762
Manchester Liners . .	451,790	255,419	675,839	122,526
Mackill S.S. Co. . .	114,840	25,491	127,867	33,294
Mercantile S.S. Co. .	328,000	12,745	320,000	76,322
Mitre Shipping Co. .	116,210	75,916	195,673	63,329
Mogul S.S. Co. . .	81,681	100,518	165,994	1,281
Monarch S.S. Co. . .	158,800	133,743	382,981	49,656
Moor Line	366,490	166,091	571,458	70,374
Nautilus S.S. Co. . .	143,145	157,167	303,929	34,560
Neptune S.N. Co. . .	210,982	87,432	303,435	38,579
Nitrate Producers' S.S. Co.	266,265	48,881	228,530	111,666
Norfolk and N. American S.S. Co.	134,975	162,216	214,405	111,754
North of England S.S. Co.	41,213	31,145	84,000	11,546
North Shipping Co. .	19,750	15,228	34,000	7,376
North Wales Shipping Co.	35,000	1,037	30,500	14,393
Orders and Handford S.S. Co.	95,500	7,798	74,500	43,328
Palace Shipping Co. .	50,672	138,552	217,435	129
Carry forward .	7,580,694	4,382,967	11,651,324	2,107,493

* Depreciation is taken at 5 per cent. on original

No. of Vessels	Tons. Gross	Profit or Loss from Voyages	Dividend on Capital	Per cent	Transferred to Depreciation, etc.	Depreciation at 5 Per cent *
		£	£		£	£
123	434,464	592,499	150,760		292,317	230,891
6	22,683	40,802	*nil*	—	28,500	27,765
1	4,809	9,970	3,600	12	5,760	2,275
31	105,164	141,538	49,957	10	80,000	42,759
6	19,276	14,305	*nil*	—	*nil*	9,314
2	7,505	8,474	2,025	7½	2,800	2,146
1	2,847	3,141	*nil*	—	*nil*	1,800
4	13,918	18,243	3,354	5	7,550	7,105
9	30,599	35,539	7,248	5·37	15,000	16,330
9	35,311	41,243	*nil*	—	31,957	22,917
3	10,665	18,201	4,116	7½	9,000	4,358
11	40,129	68,694	14,000	5	49,000	17,872
11	38,149	41,733	10,000	5	13,922	20,848
9	38,210	44,641	10,000	6¼	20,500	19,140
1	4,599	6,664	1,400	5	500	2,025
3	8,514	18,519	1,957	10	13,500	3,180
1	3,807	3,017	*nil*	—	*nil*	2,075
21	66,262	84,573	20,344	7·09	30,000	35,422
1	4,431	3,880	960	6	1,111	1,906
14	63,295	101,946	40.063	8·86	45,000	33,792
4	16,385	20,565	5,742	5	12,000	7,672
16	54,958	60,933	26,400	8·04	22,000	19,200
4	15,301	30,965	5,810	5	19,165	9,784
3	15,084	21,950	*nil*	—	*nil*	9,960
9	40,023	65,403	15,880	10	32,500	22,979
24	84,900	113,922	31,902	8·70	60,000	34,287
12	45,169	37,142	8,589	6	20,000	15,696
10	35,349	43,650	16,382	7·76	25,000	15,506
9	40,652	98,614	18,001	6·76	68,362	28,113
5	25,712	23,856	8,098	6	20,000	15,810
3	11,319	20,206	6,182	15	12,250	5,235
1	3,676	6,768	2,469	12·50	2,500	1,700
1	3,691	9,131	5,250	15	4,000	1,750
6	13,452	38,122	19,100	20	15,600	7,820
4	19,287	29,143	3,040	6	20,000	13,046
376	1,380,595	1,916,992	492,629	—	979,794	712,478

cost or 6 per cent. on written-down value.

Name of Company	Paid-up Capital	Debentures, Loans, Bills payable, etc.	Book Value of Steamers	Sundry Debtors, Bills Receivable, Investments and Cash
	£	£	£	£
Brought forward .	7,580,694	4,382,967	11,651,324	2,107,493
Peareth S.S. Co. . .	19,814	89,101	113,075	8.050
Poldhu S.S. Co. . .	24,000	8,000	32,000	3,223
Polurrian S.S. Co. .	24,000	8,000	31,948	1,782
Pool Shipping Co. . .	250,000	92,650	275,845	107,422
Portwood S.S. Co. . .	10,000	3,035	12,371	1,178
Priestfield S.S. Co. .	11,480	37,774	57,841	2,597
Pyman S.S. Co. . .	247,730	107,092	349,494	61,594
Raithwaite S.S. Co. .	47,840	17,817	58,470	14,619
Red "R" S.S. Co. .	52,999	25,699	140,264	3,200
Reindeer S.S. Co. . .	17,300	568	17,300	1,873
Rowland and Marwood S.S. Co.	132,060	39,003	202,347	19,418
Scarisbrick S.S. Co. .	17,753	17,893	39,630	2,766
Scholefield S.S. Co. .	74,690	28,853	84,880	28,688
Smailes & Sons S.S. Co. .	65,360	24,230	102,843	5,990
Southdown S.S. Co. .	75,664	19,816	118,396	18,723
Speeding & Marshall S.S. Co.	62,737	26,652	86,675	6,892
Sutherland S.S. Co. .	131,772	208,463	358,321	31,075
Tatem Steam Nav. Co. .	350,000	35,410	516,950	86,824
Taylor and Sanderson S.S. Co.	114,275	18,448	120,489	56,992
Temperley S.S. Co. .	56,520	63,528	138,071	12,745
Thompson S. Shipping Co.	73,526	75,751	147,014	9,615
Trechmann S.S. Co. .	101,260	24,942	142,788	23,257
Tredegar Hall S.S. Co. .	20.000	*nil*	20,000	1,020
Tronto S.S. Co. . .	25,792	16,698	42,500	576
Tyne and Blyth S.S. Owning Co.	60,040	5,442	65,214	3,959
Tyneside Line . .	45,000	30,043	75,826	6,887
Ulster S.S. Co. . .	195,000	154,247	374,000	27,285
West Hartlepool S.N. Co.	410,000	340,202	686,674	64,733
Wetherall S.S. Co. . .	50,000	826	55,800	10,732
Whitgift S.S. Co. . .	30,319	39,956	62,470	13,180
Wingrove S.S. Co. . .	70,000	7,239	74,456	978
Windsor Hall S.S. Co. .	20,000	*nil*	20,000	868
Woodfield S.S. Co. .	82,458	80,908	168,357	13,628
Redcroft S.S. Co. . .	9,760	26,724	33,721	5,965
Totals . .	10,559,843	6,058,067	16,477,354	2,785,817

* Depreciation is taken at 5 per cent. on original cost or 6 per

No. of Vessels	Tons. Gross	Profit or Loss from Voyages	Dividend on Capital	Per cent	Transferred to Depreciation, etc.	Depreciation at 5 Per cent *
		£	£		£	£
376	1,380,595	1,916,992	492,629		979,794	712,478
3	10,620	14,601	990	5	*nil*	5,654
1	2,793	5,418	2,400	10	2,000	2,040
1	2,801	4,413	600	2½	1,738	2,021
9	37,146	65,620	37,500	15	21,916	18,256
1	3,100	2,665	918	9·18	1,419	742
1	4,033	6,941	*nil*	—	*nil*	2,892
13	43,411	82,402	24,773	10	38,000	26,571
2	7,244	21,921	4,784	10	12,000	4,228
5	18,452	60,408	7,794	14·70	47,778	8,911
1	2,412	1,046	519	3	500	1,165
12	39,755	54,359	11,005	8⅓	32,000	13,041
2	4,544	4,450	1,243	7	2,930	2,378
4	11,704	22,229	7,469	10	7,150	5,522
4	13,182	20,808	6,536	10	12,000	6,171
5	14,668	30,344	9,080	12	20,929	7,104
2	6,246	12,207	1,568	2½	3,000	5,200
13	47,672	52,397	9,882	7½	20,000	24,952
20	84,908	†211,724	42,000	12	156,800	34,317
7	22,136	39,468	17,141	15	17,500	7,230
4	12,784	15,620	2,826	5	7,500	6,904
5	15,543	15,318	2,544	3·45	5,000	8,821
8	20,508	12,833	6,076	6	5,000	8,567
1	3,764	12,593	3,200	16	8,972	1,700
1	4,668	7,311	1,280	4·96	5,000	2,850
2	4,727	4,613	1,501	2½	1,000	3,261
6	7,812	9,190	4,500	10	3,270	4,549
15	47,282	†35,858	9,750	5	20,000	23,040
17	54,971	64,035	*nil*	—	7,533	36,908
5	4,350	13,019	4,000	8	7,300	3,348
1	4,397	3,332	*nil*	—	*nil*	3,123
2	5,369	524	*nil*	—	*nil*	3,719
1	3,694	9,534	2,600	13	6,390	1,575
10	30,622	29,686	2,474	3	7,500	10,101
1	4,294	4,633	976	10	2,000	1,689
561	1,981,209	2,869,516	720,558	6·82	1,463,919	1,011,028

cent. on written-down value. † At the rate of.

APPENDIX VIII—*Continued*

Ten Years of Cargo-Boat Earnings

Year	Paid-up Capital	Debenture Loans	Book Value of Steamers	No. of Vessels	Tons Gross	Profit on Voyages	Dividend on Capital	Per cent	Deprecia-tion written off	Deprecia-tion 5 per cent
1904	£7,594,278	£3,157,128	£10,753,752	393	1,184,358	£640,541	£277,129	3·64	£216,154	£622,725
1905	8,577,424	3,775,681	12,353,849	464	1,362,049	762,698	286,005	3·33	238,505	740,901
1906	8,081,800	3,669,142	12,130,285	433	1,336,823	979,545	327,445	4·05	348,651	731,971
1907	9,167,259	4,448,905	13,732,764	490	1,516,401	1,079,257	383,077	4·17	413,390	832,716
1908	9,622,401	4,409,343	14,338,652	533	1,695,837	1,145,387	335,165	3·48	393,696	876,170
1909	9,517,011	4,985,051	13,915,494	508	1,603,341	647,997	179,886	1·89	189,043	837,890
1910	9,457,650	5,548,999	14,610,877	522	1,725,335	842,511	217,681	2·30	290,115	864,187
1911	9,883,584	6,261,588	15,717,739	535	1,833,360	1,471,541	370,061	3·73	506,040	943,088
1912	10,559,843	6,058,067	16,477,354	561	1,981,209	2,869,516	720,558	6·82	1,463,919	1.011,028
1913	10,964,108	5,490,388	16,682,965	598	2,121,427	5,505,850	1,377,615	12.56	3,344,643	1,073,665
Average	£9,342,535	£4,780,429	£14,071,373	503	1,636,014	£1,594,484	£447,462	4·78	£740,415	£853,434

APPENDIX IX

Shipping Profits.

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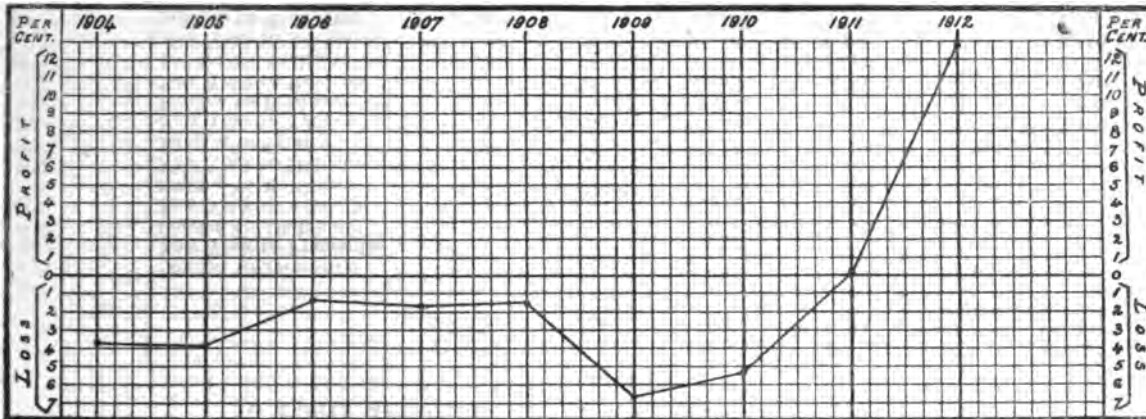


This diagram shows at a glance the amount of profit which has been made by cargo boat companies during the past nine years. The profits have been arrived at by deducting the interests on loans, office expenses, and depreciation at the rate of 5 per cent. per annum on the cost of the fleet.

APPENDIX X

TABLE OF DISTANCES (SPECIALLY CALCULATED FOR THIS BOOK) FROM THE CHIEF EUROPEAN PORT, LONDON, AND THE CHIEF AMERICAN PORT, NEW YORK, TO PORTS AFFECTED BY THE PANAMA CANAL.

	Via Cape of Good Hope	Via Cape Horn	Via Suez Canal	Via Panama Canal	Saving via Suez over Panama	Saving via Panama over Suez
London to Fremantle .	10,900	..	9,340	14,550	5,210	..
New York to Fremantle .	[1]11,571	..	11,317	11,910	593	..
London to Adelaide .	11,910	..	10,748	12,996	2,248	..
New York to Adelaide .	[1]12,580	..	12,650	[2]10,356	..	2,294
London to Melbourne .	12,220	..	11,057	12,860	1,803	..
New York to Melbourne .	[1]12,850	..	12,920	[2]10,226	..	2,694
London to Sydney . .	12,530	..	11,542	11,579	28	..
New York to Sydney .	[1]13,120	..	13,390	[2]9,930	..	3,460
London to Brisbane .	13,030	..	12,043	11,750	..	293
New York to Brisbane .	[1]13,660	..	13,890	[2]9,110	..	4,780
London to Auckland .	13,760	..	12,600	11,580	..	1,020
New York to Auckland .	[1]14,390	..	13,480	[3]8,940	..	4,540
London to Wellington .	13,280	..	12,447	11,370	..	1,077
New York to Wellington .	[1]13,910	..	13,327	[3]8,730	..	4,597
London to Dunedin .	12,940	..	12,107	11,610	..	497
New York to Dunedin .	[1]13,570	..	13,987	[3]8,970	..	5,017
London to Calcutta .	11,730	..	7,900	17,210	9,310	..
New York to Calcutta .	[1]12,360	..	9,780	14,570	4,790	..
London to Singapore .	11,417	..	8,241	15,580	7,339	..

New York to Singapore .	[1]11,040	..	10,121	12,940	2,819	..
London to Manila .	12,980	..	9,560	14,260	4,700	..
New York to Manila .	[1]13,610	..	11,440	11,620	180	..
London to Hong Kong .	13,030	..	9,681	14,410	4,729	..
New York to Hong Kong	[1]13,660	..	11,561	11,770	219	..
London to Shanghai .	13,790	..	10,441	15,430	4,989	..
New York to Shangai .	[1]13,420	..	12,321	11,240	..	1,081
London to Yokohama .	14,287	..	11,112	12,860	1,748	..
New York to Yokohama .	[1]14,917	..	12,992	10,220	..	2,772
London to Coronel . .	..	8,557	..	7,720	..	837
New York to Coronel .	..	8,217	..	5,080	..	3,138
London to Valparaiso .	..	8,777	..	7,360	..	1,417
New York to Valparaiso .	..	8,452	..	4,720	..	3,732
London to Iquiqui . .	..	9,555	..	6,840	..	2,715
New York to Iquiqui .	..	9,233	..	4,200	..	5,033
London to Callao . .	..	10,013	..	6,190	..	3,823
New York to Callao .	..	9,688	..	3,550	..	6,138
London to San Francisco	..	13,548	..	8,010	..	5,538
New York to San Francisco	..	13,223	..	5,370	..	7,853
London to Portland Or. .	..	14,163	..	8,625	..	5,538
New York to Portland Or.	..	13,838	..	5,985	..	7,853
London to Vancouver City	..	14,348	..	8,810	..	5,538
New York to Vancouver City	..	14,023	..	6,170	..	7,853
London to Pernambuco .	4,124	Not affected by either Suez or Panama.				
New York to Pernambuco	3,760					
London to Rio de Janeiro	5,197					
New York to Rio de Janeiro	4,760					
London to Buenos Ayres .	6,291					
New York to Buenos Ayres	5,888					

[1] Via St Vincent. [2] Via Rapa and Wellington. [3] Via Rapa.

APPENDIX XI

Price and Conditions of Supply of Coal at Various Coaling Ports for the Year 1912.

(These prices are extracted from actual Contracts.)

Port	Description of Coal	Price and Condition of Supply
Aarhus	North Country	21/- F.O.B. and trimmed per ton of 1000 kilos.
Adelaide	Southern or Newcastle, N.S.W.	23/- F.A.S. in the river.
	do. do.	24/- F.A.S. in outer harbour.
Aden	Welsh	Current.
Albany	Southern or Newcastle, N.S.W.	25/6 F.A.S.
Alexandria	Welsh	27/- F.O.B.
	North Country	21/6 F.O.B.
Algiers	Welsh	20/9 F.O.B.
	North Country	19/9 F.O.B.
Amsterdam	Westphalian	13/9 F.O.B.
Antwerp	Westphalian	13/6 F.O.B. and trimmed.
Auckland	Coalbrookdale	20/6 ex steamer F.O.B.
Azores (St Michaels)	Welsh	31/- F.O.B. and trimmed
Bahia	Welsh	49/6 F.O.B. as Buenos Ayres.
Bahia Blanca	Welsh	42/- F.O.B. as Buenos Ayres
Baltimore (in harbour)	Best Clearfield bituminous	$3.15 F.O.B. and trimmed.
Barbadoes	American	23/- F.O.B. and trimmed. In quarantine 1/- per ton extra. Sunday, holiday or night work extra.

Bergen	Best North Country	20/– F.O.B. and trimmed per ton of 1000 kilos.
Bermuda	Best New River	29/– F.O.B. St George's Harbour
	Pocohontas	35/– F.O.B. Murray Anchorage.
Bilbao	Welsh	24/6 F.O.B. and trimmed in river. Outer harbour 1/– per ton extra. Extra for work on Sundays, holidays or at night.
Bombay	Best Deshurgur	16/6 F.O.B. If bunkering in stream in fine weather 6d. per ton extra, if during Monsoon 1/6 per ton extra.
Brisbane	Queensland	15/6 F.A.S. Morton Bay.
	Queensland	10/6 F.A.S. Railway wharf.
Bordeaux	Welsh	24/– F.O.B. per ton of 1000 kilos.
	North Country	23/– F.O.B. per ton of 1000 kilos.
Boston	Peerless Pocohontas	$4.10 F.O.B., trimming 15 cents per ton extra.
	New River	$4.10 F.O.B., trimming 15 cents per ton extra.
Bremen (Freihafen)	Westphalian and North Country	16/3 per ton of 1000 kilos. Trimming 3d. per ton extra. Sunday, holiday or night work extra. Payment to be made on delivery in cash less 1% discount, or by captain's draft at 30 days.
Bremerhaven	Westphalian	15/9 do.
	North Country	15/9 do.
Brünsbuttel	North Country	17/6 F.O.B. per ton of 1000 kilos.
Buenos Ayres	Welsh	39/– F.O.B. docks. Sunday, holiday, night or in quarantine extra.
Calais	French Naval	16/– F.O.B. and trimmed per ton of 1000 kilos. Sunday, holiday or night work 6d. per ton extra.
Calcutta	Best Bengal	8 Rs. F.O.B. and trimmed.
Cape Breton Island	Dominion	$3.25 on ship's rail at shoots. Trimming 15 cents per ton extra.
Capetown	Natal Navigation	24/– trimmed into bunkers at docks.

Port	Description of Coal	Price and Condition of Supply
Catania	Welsh	22/9 F.O.B., 1/– per ton extra ex lighters.
Charleston	Best New River	$5.35 F.O.B. and trimmed. Sunday, holiday, night or quarantine extra.
	Pocohontas	$5.35
Chingwantao	Kaiping (lump)	13/9 F.O.B. and trimmed alongside wharf.
Christiania	Northumberland	20/– per ton of 1000 kilos ex lighters in harbour. Trimming 6d. per ton extra. Sunday, holiday or night work 50 öre per ton extra. Screened coal 1/3 per ton extra.
	Durham (unscreened)	20/–
Colombo	Welsh	35/– F.O.B. Trimming 3d. per ton extra (1910, 27/9).
	Delmege (Indian)	21/6
	Best Natal	25/– F.O.B. and trimmed.
	Bengal (Deshurgur)	21/–
Constantinople	Welsh	25/– Sunday or night work 6d. per ton extra. Scutari side 1s. per ton extra, at Kavak 2/– per ton extra, F.O.B.
	Durham (unscreened)	21/–
	Best Candyli	20/3
Copenhagen	Best Newcastle	17/– F.O.B., from lighters 1/– per ton extra. Night or holiday labour 6d. per ton extra.
	Durham	17/–
Corcubion	Welsh	24/– F.OB. alongside hulk. Night, Sunday, or holiday labour extra.
Dairen (Dalny)	Fushun lump)	
Dartmouth	Northumberland (unscreened).	16/6 F.O.B. at hulks, exclusive of trimming and other expenses usually borne by steamer.
	Durham (unscreened)	17/–
Delagoa Bay	Witbank	13/– F.A.S. wharf. Dues and trimming 1/– per ton extra (ton 2000 lbs.).

Dunkirk	French Naval	19/3 per ton of 1000 kilos F.O.B. and trimmed ex lighters.
	Durham	19/3
Durban	Best Utrecht large steam	14/- F.A.S. steamer at wharf (1910, 13/9).
Emden	Westphalian	16/- F.O.B., trimmed per ton of 1000 kilos.
Fayal	Welsh	32/- F.O.B. and trimmed.
Ferrol	Welsh	23/6 F.O.B. alongside hulk.
Fiume	North Country	22/6 F.O.B. per ton of 1000 kilos, 6d. per ton extra for Sunday or night labour Public weigher's certificates to be accepted.
Freemantle	Southern	25/6 F.O.B. but not trimmed.
	Newcastle, N.S.W.	25/6
Galveston	Pocohontas	$5.85 trimmed in harbour per ton of 2000 lbs.
Geestemunde	Westphalian	16/3 terms as Bremen.
	North Country	16/3
Genoa	Welsh	23/3 F.O.B. Sunday, holiday and night labour 1/3 per ton extra.
	North Country	20/3
Ghent	Westphalian	14/6 F.O.B. and trimmed.
Gibraltar	Welsh	23/– F.O.B. alongside hulk or mole at suppliers' option.
	Durham (unscreened)	21/–
Gothenburg	Northumberland (large screened steam)	18/6 F.O.B. and trimmed.
Gulf port	Alabama Pratt	$3.40 per ton of 2000 lbs. trimmed at pier. Ex lighters in stream 25 cents per ton extra. Night, Sunday or holiday labour 25 cents per ton extra.
	Cahaba	$3.40
Halifax N.S.	Dominion	$4.50 on ships' rail. Trimming 15 cents per ton extra.
Hamburg	Northumberland steam	12/9 F.O.B. Trimming extra. Sunday, holiday and night labour extra.
	Durham	13/3

Port	Description of Coal	Price and Condition of Supply
Havre	Welsh	21/6 } F.O.B. Sunday, holiday and night labour
	North Country	19/6 } extra.
Hong Kong	Kaiping (lump)	19/3 F.O.B. and trimmed alongside wharves or in harbour.
Karachi	Best Jardine Navigation	16/6 } F.O.B. and trimmed.
	Deshurgur	16/9 }
Karatsu	Good Karatsu (lump)	13/6 F.OB. and trimmed.
Keelung	Best Keelung steam	15/– F.O.B. and trimmed.
Kobe	Akaiike (lump)	16/9 F.O.B. trimmed.
Labuan	Best Labuan	F.O.B. harbour. Trimming extra.
La Plata	Welsh	39/– F.O.B. wharf, as Buenos Ayres.
Las Palmas	Welsh	22/– } F.O.B. and trimmed. Sunday, night or
	Durham (unscreened)	19/– } quarantine labour extra.
Leghorn	Welsh	29/– } per ton of 1000 kilos. Trimming 6d. per
	North Country	21/6 } ton extra; overtime extra.
Lisbon	Welsh	24/3 } F.O.B. and trimmed.
	North Country	23/– }
Lyttelton	Coalbrookdale	19/6 F.O.B. ex steamer.
Madeira	Welsh	23/– F.O.B. and trimmed.
Malta	Welsh	22/– } F.O.B., no extra charge if loaded at night.
	Durham (unscreened)	20/– }
Manila	Good Australian	23/9 } F.O.B. and trimmed.
	Japanese	21/– }
Marseilles	Welsh	25/6 F.O.B.
Mauritius	Welsh	39/– } F.O.B. (1910, 41/–). Trimming 1/– per ton
	North Country	33/6 } extra. Sunday night or quarantine labour
	Natal and Transvaal	33/6 } extra.

Melbourne	Southern or Newcastle, N.S.W.	19/6 in Yarra or in Hobson Bay.
Messina	Welsh	20/- F.O.B., ex lighters 1s. per ton extra.
	North Country	19/- F.O.B., ex lighters 1s. per ton extra.
Mobile	Best Alabama steam	$3.15 per ton of 2000 lbs. Trimming 10 cents per ton extra. Sunday, night or holiday work 25 cents per ton extra.
Moji	Akaiike (lump)	13/- F.O.B. and trimmed.
	Good Japan (lump)	12/- F.O.B. and trimmed.
Monte Video	Welsh	41/- F.O.B., 1/- per ton less if supplied in harbour.
Nagasaki	Matsushima (lump)	14/3 F.O.B. and trimmed.
Naples	Welsh	24/- F.O.B., 4d. per ton extra for trimming.
Newcastle, N.S.W.	Seaham, Abermain or Neath (best screened)	11/- F.O.B. alongside Government cranes.
Newchwang	Kaiping (lump)	16/3 F.O.B. and trimmed in stream. If alongside wharf 1/- per ton less.
New Orleans	Pittsburg steam	$3.75 per ton of 2000 lbs. F.O.B. and trimmed.
	Pratt	$3.50 per ton of 2000 lbs. F.O.B. and trimmed.
Newport (News)	New River	$3 F.O.B. at piers. Trimming 10 cents per ton extra.
New York	Best Clearfield bituminous steam	$3.15 F.A.S.
Nordenham	North Country	15/9 Terms as at Bremen.
	Westphalian	15/9 Terms as at Bremen.
Norfolk (Va.)	Best Pocohontas	$3 F.O.B. Trimming 10 cents per ton extra.
Oran	Welsh	23/6 F.O.B.
	Durham (unscreened)	21/- F.O.B.
Otaru	Yubari (lump)	16/- F.O.B. and trimmed.
Penang	Best Australian	24/- F.O.B.
	Bengal (Jardines Navigation)	19/6 F.O.B.
	Japanese	21/6 F.O.B.

Port	Description of Coal	Price and Condition of Supply
Pensacola	Cahaba	$3.25 F.O.B. and trimmed per ton of 2000 lbs.; 25 cents per ton extra for Sunday or night work.
Perim	Welsh	Current
Pernambuco	Welsh	49/6 F.O.B. Terms as at Buenos Ayres
Philadelphia	Best Clearfield bituminous steam	$3.15 F.O.B. and trimmed.
Piræus	Welsh	22/6 F.O.B. per ton of 1000 kilos; lighterage, if required, extra.
	Durham (unscreened)	20/9
Plymouth	Welsh	22/6 F.O.B.
	Durham (unscreened)	17/–
Port Chalmers	Coalbrookdale	21/6 F.O.B. ex steamer.
Port Natal	Natal Navigation	14/9 F.A.S.
	Klobane (screened)	14/–
Portland	Durham (unscreened)	17/– F.O.B. alongside hulks, exclusive of trimming and other expenses usually born by steamer.
	Northumberland do.	16/6
Port Said	Welsh	26/– F.O.B. and trimmed (1910 22/6). Sunday, holiday and night labour extra.
	Durham (unscreened)	22/6
Pulo Laut (S.E. Borneo)	Pulo Laut (lump)	14/– F.O.B. and trimmed alongside wharf.
Rangoon	Heilgers standard	18/9 F.O.B. and trimmed.
Rio de Janeiro	Welsh	36/– F.O.B. as at Buenos Ayres.
Rosario	Welsh	43/– F.O.B. as at Buenos Ayres.
Rotterdam	Westphalian	13/6 F.O.B. per ton of 1000 kilos.
	North Country	13/6

Rouen	North Country	20/- If supplied in docks 1/- to 2/6 per ton extra. Payment in cash before departure for steamer.
St John N.B.	Dominion	$4.75 F.O.B. and trimmed.
St Lucia	American	23/- F.O.B. and trimmed alongside wharf. Sunday, night, holiday or quarantine labour extra.
St Michaels	Welsh	29/6 F.O.B. and trimmed.
St Nazaire	Welsh	27 francs 50 cs. F.O.B. per ton of 1000 kilos.
St Thomas W.I.	Best Pocohontas steam	22/- F.O.B. alongside wharf. Trimming 3d. per ton extra. Ex lighters 2/- per ton extra.
St Vincent	Welsh	31/- F.O.B. at Naval anchorage. Sunday, night, holiday or quarantine labour extra.
Santos	Welsh	44/6 F.O.B. as at Buenos Ayres.
Savannah	New River	$4.20 F.O.B. and trimmed at wharf.
	Maryland Company's Imperial	$4.20
Savona	Welsh	27/3 Sunday, holiday, and night labour extra as per port tariff.
	North Country	22/6
Sewalls Point	New River	$3 F.O.B. at pier. Trimming 10 cents per ton extra.
Shanghai	Kaiping (lump)	15/- F.O.B. and trimmed alongside wharf. In stream 1/- per ton extra.
Singapore	Welsh	35/- F.O.B. alongside wharf.
	Australian	24/-
	Japanese	22/6
	Bengal	19/6
Smyrna	Welsh	Current. Trimming 3d. per ton extra.
Spalato	Best Newcastle	26/- F.O.B. per ton of 1000 kilos. Lighterage, if required, extra.
Stettin	North Country	16/9 F.O.B. per ton of 1000 kilos.
	Silesian	16/9

Port	Description of Coal	Price and Condition of Supply
Suez	Welsh	36/– F.O.B. and trimmed.
Sydney	Wallarah	11/6 per ton of 2240 lbs. Loading and trimming 1/6 per ton extra.
Syra	Welsh	22/3 } F.O.B. Bunkering in quarantine extra.
	Durham (unscreened)	20/6 }
Taku Bar	Kaiping (lump)	14/9 F.O.B. and trimmed.
Teneriffe	Welsh	22/– } F.O.B. and trimmed. Sunday, night or quarantine labour extra.
	Durham (unscreened)	19/– }
Tongku	Kaiping (lump)	12/9 F.O.B. and trimmed alongside wharf.
Trieste	Welsh	28/6 } F.O.B. per ton of 1000 kilos., 6d. per ton extra for work on Sunday or at night. Public Weigher's certificates to be accepted.
	North Country	20/6 }
Trinidad	Pocohontas steam	22/– per ton of 2240 lbs. ex hulks. Ex lighters 2/– per ton extra. Sunday, night or holiday labour extra.
Vigo	Welsh	24/3 F.O.B. alongside hulk.
	Welsh	25/3 F.O.B. ex lighters.
Wakamatsu	Akaiike (lump)	12/3 F.O.B. and trimmed.
Wellington, N.Z.	Coalbrookdale	18/6 F.O.B. ex steamer.
Wilmington	Pocohontas	$4.85 F.O.B. trimming 10 cents per ton extra.
Yokasuka	Yubari (lump)	20/6 F.O.B. and trimmed.
Yokohama	Yubari (lump)	18/6 F.O.B. and trimmed.
Zea	Welsh	22/6 } F.O.B.
	Durham (unscreened)	20/6 }

APPENDIX XII

TABLE SHOWING VALUE AND MEASUREMENT OF VARIOUS COALS AND PETROLEUM.

	Carbon	Total Heat of Combustion	Evaporative Power from and at 212°	Cubic Feet to 1 Ton
	Per Cent	Units	Pounds	
[1] Welsh best . . .	88·26	15,788	16·34	..
[1] Welsh average . .	83·78	14,858	15·52	42·7
[1] Newcastle . . .	82·12	14,820	15·32	45·3
[1] Derbyshire . . .	79·68	13,860	14·34	47·4
[1] South Yorkshire . .	81·88	14,296	14·71	46·0
[1] Lancashire . . .	77·90	13,918	14·56	45·2
[1] Scotch . . .	78·53	14,164	14·77	42·0
[1] American (bituminous)	73·21	[2]13,861–14,140	..	42·44
[1] American (anthracite) .	88·54	..	..	42·35
[1] French (hard ditto) .	88·56	15,525	16·10	42·75
[1] Indian (average) . .	70·20	..	..	..
Australian . . .	..	..	..	..
New South Wales :—				
1. Mount Kembla .	62·29	..	12·6	..
2. Bulli (Natural Coke from old Bulli mine) .	80·05	..	..	..
3. Belambi . .	..	..	..	..
American (semi-Anthracite)	85–90	..	..	..
do. (hard dry ditto) .	91–98	..	..	..
Petroleum :—				
[1] American (Crude) .	84·7	20,240	20·33	39–46
[1] Caucasian (Crude) .	86·6	20,138	20·85	42·

[1] Taken from Seaton and Rounthwaite's *Pocket Book of Marine Engineering*, p. 238.

[2] Taken from Emory Johnson's Report, p. 158.

From Meade's "Coal and Iron Industries of the United Kingdom."

Durham and Northumberland:—

Colliery	Carbon	
Haswell	83·47	Household
Hartley	84·28	Household
Original Hartley	81·18	Household
South Peareth	81·41	Gas Coal
Bowden Close	84·92	Gas Coal
Willington	86·81	Gas Coal
Garesfield	86·9	Gas Coal
Buddles Hartley	78·69	Steam Coal
Newcastle ,,	81·81	Steam Coal
Haswell (Sunderland)	83·71	Steam Coal
Seaton Burn	78·65	Steam Coal

Nottingham:—

	Carbon
Coal in Shireoaks neighbourhood	77·40
Portland Colliery, Kirkby	80·41
Langley Colliery	77·97

Leicester:—

Ibstock	74·97
Whitwick	69·00

Shropshire:—

Donnington	63·8
,,	62·1
Madeley	64·9
Ketley	56·1
Madeley	64·4
,,	62·7
Broseley	61·1

Yorkshire :—

	Carbon.
Barnsley	80·05
Elsecar	81·93
Park Gate	80·07
Wombwell Main	80·50
Darfield Main	81·39
Oaks	82·52
Masbro Park	82·19
Edmund Main	82·19

FRANCE.[1]

	Carbon
Anthracite, common	79·15

According to the Analyses of M. Regnault :—

	Carbon
Anthracite	95
Anthracite Coal	92
Coal, Maigre, with short flame	90
Coal, Demi-grasse	87
Coal, Grasse	85
Coal Gas	85
Coal, Maigre, with long flame	78

Weight of a cubic yard in lbs.—

	Locality	lbs.
France :	Allier	2207
	Tantal	2283
	Brassac	2413

PENNSYLVANIA.

The following information is given by Dr Chance, State Geologist of Pennsylvania, and published in a book on *The Anthracite Coal Industry* by P. Roberts in 1901.

[1] From the *Report of the Coal Commission*, 1871.

Semi-Anthracite, 85 to 90 per cent. Carbon.
Hard dry Anthracite, 91 to 98 per cent. Carbon.

The average weight of hard and dry Anthracite is 2362 lbs. per cubic yard.

Japan.

From a *Report of the Mining Industry of Japan (Past and Present)*, issued by the Department of Agriculture and Commerce, Tokio, in 1909.

Average of :—	Carbon
25 Collieries in Fukuoka Prefecture . .	53·22
4 ,, Saga ,, . .	52·70
4 ,, Nagasaki ,, . .	57·22
7 ,, Kumonoto ,, . .	81·21
4 ,, Hokkaido ,, . .	52·65
5 ,, Honshu (Main Island) . .	36·71
4 Anthracite Collieries, Yamaguchi Prefecture	68·73
4 Brown Coal Collieries, County of Asa .	37·51
1 Anthracite Colliery, Wakayama Prefecture	87·26

The following table gives an estimate formed by an experienced English shipmaster of the steaming values of various coals as compared with the best Welsh Steam Coal. Although of no scientific importance, the comparison may have some practical value :—

One Hundred tons of best Welsh Steam Coal will, on an average, do the same amount of work as	112 tons Southern Coal (Australia). 120 tons Newcastle, New South Wales Coal. 130 tons Brisbane Coal. 140 tons Western Australian Coal. (This coal is improving in quality.) 105–110 tons Clearfield Coal, as supplied at New York. 105–108 tons English North Country Coal.

An American estimate may be usefully compared with the above :—

"The efficiency of several kinds of coal is roughly indicated by a statement made by the captain of a vessel who reports that his ship's daily coal consumption is 22 tons of best No. 1 Welsh, 25 tons of Tyne, 29 to 30 of Indian or Japanese, 24 to 25 of Newcastle (Australian), 30 of Chilean, 24 to 25 of New River (West Virginian), and 26 of Alabama coal. Another vessel was reported to have a daily consumption of 25 tons of best Welsh as compared with 26½ tons of Pocohontas, 26 Welsh run-of-mine, 28 of Lancashire or Tyne, and 30 of Indian or Japanese coal. Pocohontas coal is particularly effective in vessels with forced draft, in which class of vessels its steam value is about equal to that of Welsh coal." [1]

[1] *Cf*. Emory Johnson's *Panama Canal Traffic and Tolls*, 1912, p. 159.

APPENDIX XIII

SOME IMPORTANT SHIPPING DATES

1194 (?). Laws of Oléron.
1344. Madeira discovered by the English (?).
1492. Columbus discovered Hispaniola.
1497. John Cabot discovered the Mainland of America.
1498. Vasco da Gama discovered the Cape Route to India.
1508. First mention of Marine Insurance in England.
1513. Balboa sighted the Pacific Ocean.
1514. Henry VIII. incorporated by Royal Charter the Trinity House. The *Great Harry* launched at Erith.
1545. First treatise on Navigation published.
1608. First effective Telescope produced.
1660. Board of Trade and Plantations established.
1688. First mention of Lloyd's Coffee-House in Tower Street.
1692. Lloyd's Coffee-House removed to Lombard Street.
1696. "Lloyd's News" established.
1700. First Dock opened at London.
Marine Barometer invented.
1715. First Dock opened at Liverpool.
1720. First Marine Insurance Company established.
1726. "Lloyd's News" reissued under the name of "Lloyd's List.'
1731. The Sextant invented.
1735. Harrison invented the Marine Chronometer.
1740. Oldest "Lloyd's List" in existence.
1767. The "Nautical Almanac" first published.
1768. Captain Cook's first voyage of discovery.
1774. Lloyd's removed to the Royal Exchange.
1779. Murder of Captain Cook.
1782. Insurance subjected to Stamp Duty.
1786. First Registration of Shipping, London. Board of Trade and Plantations modified; this inaugurated the present Board of Trade, "a Committee of Council on Trade." First use of rolled plates for boiler construction.

1787. Registration of Shipping throughout the Empire.
1788. Settlement commenced in Australia. Foundation of the City of Sydney.
1790. Lifeboats first used.
1798. River Police instituted at London.
1802. The West India Docks, London, opened.
1805. The London Docks opened.
1806. The East India Docks opened.
1812. The *Comet* steamboat on the Clyde.
1813. First notice of an iron cable being part of a ship's equipment in "Lloyd's Register."
1815. First Steam Vessel on the Thames.
1817. New Custom House, London, opened.
1818. Auxiliary steamer, *Savannah*, crossed the Atlantic.
1819. First iron craft, the *Vulcan*, built on the Forth and Clyde Canal.
1820. Royal Astronomical Society founded.
1822. First steamer registered by Lloyd's. (Five years later there were 81 steamers on the Register.)
1825. First auxiliary steam voyage to India.
Iron steamer commenced service on River Shannon.
1828. St Katherine's Docks, London, opened.
1829. The name *Lloyd's Registry of Shipping* used for the first time.
1830. Royal Geographical Society founded.
1833. Trade with India thrown open.
1836. "Shipping and Mercantile Gazette" founded.
1837. The P. & O. Company founded.
First iron ship registered by Lloyd's. The *Sirius*, 180 tons, built at London, owned at Marseilles.
1838. *Great Western* and *Sirius* commenced regular steam service across the North Atlantic.
The Screw Propeller introduced.
First Regular Steamboat Service across Atlantic; voyage seventeen days.
1839. The Cunard Company founded. (Originally called The British and North American Royal Mail Steam Packet Co.)
1840. Penny Post.
First Cunard steamer, *Britannia*, sailed.
1843. Iron steamships first built in Great Britain.
1846. Corn Law passed.
1847. Gold discovered in California.

1848. North-West Passage discovered.
1850. An Act for improving the condition of Masters, Mates, and Seamen, and maintaining discipline in the Merchant Service, passed. This Act made it (i.) compulsory for the Senior Officers to hold certificates of efficiency; (ii.) necessary to establish Shipping Offices at the principal ports; (iii.) to house and diet sailors according to rules, and (iv.) obligatory to keep an Official Log.
1851. First Submarine Telegraph.
Queen's Cup won by yacht *America*.
1855. Meteorological Office established.
1856. Free Navigation of Danube secured under European Commission.
Declaration of Paris signed by European Powers.
1857. International Code of Signals established.
1858. *Great Eastern* launched.
First message by Atlantic Cable—but submarine Atlantic Cable not permanently successful until 1866.
1859. Royal Naval Reserve authorised.
1860. First steam ironclad launched.
1861. Storm Warnings first issued.
1862. International Rule of the Road at Sea settled.
1863. Twin-screws used.
1864. Royal School of Naval Architecture established.
1866. Atlantic Cable laid by *Great Eastern*.
1867. Marine Insurance Duty reduced.
1869. Suez Canal opened.
1870. Telegraphs transferred to Government.
Ice-breaking vessel first employed.
1871. Lloyd's incorporated.
German Empire proclaimed.
1872. Daily weather-charts first issued.
1873. Royal Naval College opened.
1874. International Postal Convention.
1876. Amsterdam-North Sea Canal opened.
1877. Telephone invented.
1878. Chamber of Shipping of United Kingdom established.
1880. Royal Albert Dock opened.
First shipment of frozen mutton from Australia arrived in London.
1881. London Chamber of Commerce incorporated.

1881. *Aberdeen* (s.) Triple-Expansion Engines.
1882. New Eddystone Lighthouse opened.
1884. First compound steam turbine engine built.
1885. First steamer converted to carry oil in bulk.
1886. Tilbury Docks opened.
1887. Colonial Conference in London.
1889. New Barry Docks, Cardiff, opened.
1893. London Shipping Exchange opened.
Imperial Institute inaugurated.
Corinth Ship Canal opened.
1894. Merchant Shipping Act passed, consolidating former Acts.
Manchester Ship Canal opened.
Turbinia, first turbine steamer, launchd on the Tyne.
Quadruple Expansion Engines invented.
1895. Baltic and North Sea Canal opened.
1897. Blackwall Tunnel opened.
1898. War between United States and Spain.
Imperial Penny postage instituted.
1899. War in South Africa commenced.
International Meteorological Committee established.
First Wireless Telegraphy with France.
1900. Merchant Shipping (Liability of Shipowners) Act passed.
Subsidised steamship service with Jamaica arranged.
Wireless Telegraphy adopted by Admiralty.
Advisory Committee on Commercial Intelligence appointed by Board of Trade.
1901. Commonwealth of Australia inaugurated.
New International Code of Signals in use.
Discovery Antarctic Expedition sailed.
International Maritime Congress, Washington.
First Turbine Steamer on Clyde.
Export duty of 1s. per ton levied on coal.
Royal Commission on Coal Supplies of the United Kingdom.
1902. Report of Trinity House Fog Signal Committee.
Report of Admiralty Committee on Merchant Cruisers issued.
Combination of Atlantic S.S. Lines.
Colonial Conference in London.
Report of Royal Commission on Port of London issued.
British Pacific Cable opened.
Messages sent by wireless telegraphy across the Atlantic.
1903. Government Agreement with the Cunard Company.

1903. Report of Board of Trade Committee.

Report of Select Committee of House of Lords on Light Load Line issued.

Light Dues reduced 12½ per cent.

International Conference on Wireless Telegraphy at Berlin.

First Report of Royal Commission on Coal Supplies issued.

New Baltic Mercantile and Shipping Exchange opened London.

Cross-Channel steamers propelled by steam turbines.

Dr Diesel invented the Internal Combustion Marine Engine.

1904. Panama Canal concession acquired by United States.

Long voyage on oil fuel—*Nebraskan* (s.), California to New York, 12,724 knots, in 51 days, 7 hours.

Steam turbines adopted by Cunard Company.

Sailing Shipowners' International Union established.

Daily Paper, with news by wireless telegraphy, published at sea on *Campania* (s.).

Wireless telegraphy weather reports received from Atlantic liners at sea.

Wireless Telegraphy Act passed.

New International Telegraphic Code in operation.

New German steering regulations.

Report of Departmental Committee on law relating to compensation for injuries to workmen, including seamen, issued.

Victorian, first transatlantic turbine seamer, launched. Return of Antarctic Expedition.

1905. Continuous wireless telegraphic communication with land reported by Atlantic liner.

Baltic and White Sea Conference (of steamship owners) formed.

Report of Royal Commission on Coal Supplies issued.

Record Atlantic passage by turbine steamer *Virginian*, 4 days, 6 hours.

Committee on Tonnage Measurement and Rates appointed by Board of Trade.

Shipowners' Negligence (Remedies) Act passed.

1906. *Lusitania* and *Mauretania*, largest and fastest liners, launched.

R. C. Rickmers (German five-masted barque with auxiliary steam power, 5548 tons), largest sailing vessel, launched.

Panama Canal—Lock type decided upon.

1906. Royal Commission on Canals and Waterways appointed.
New Load Line Tables in operation, 1st March.
Marine Insurance Act, operating from 1st January 1907 passed.
Report of Board of Trade Committee on Tonnage Measurement for Dock Dues issued.
Merchant Shipping Act, 1906, passed, operating from 1st June 1907, save as otherwise provided.
Coal export duty of 1s. per ton repealed as from 1st November.
Royal Commission on Shipping Rings appointed.
Trials of submarine signalling apparatus conducted by Admiralty.
Ocean voyages by *Port Jackson* as training ship for boys.
First wireless telephony experiments.

1907. Colonial Merchant Shipping Conference in London.
Light Dues reduced further 7½ per cent. as from 1st April.
Report of New Zealand Royal Commission on Fires on Wool Ships issued.
Merchant Shipping Act, 1907, passed (Tonnage Deduction for Propelling Power), operating from 1st January 1914 for ships existing, under construction, or contracted for before 1st May 1907.
Shipping Federation Committee on supply of officers for the Mercantile Marine appointed.
New Zealand proclaimed a Dominion. International Yacht Racing Union formed, and rules adopted.

1908. Gyroscopic apparatus to prevent rolling of ships invented.
Porhydrometer—automatic cargo-weighing apparatus—invented.
Report of Royal Commission on Lighthouse Administration issued.
Light Dues reduced further 10 per cent. (total reduction 30 per cent.), to take effect 1st April 1909.
Stamp-duty on Marine Insurance. Voyage policies reduced from 3d. to 1d. per cent., to take effect 1st January 1909.
S.S. *Otaki*, first merchant vessel fitted with combination of reciprocating engines and turbines, built.
Port of London Authority established by Port of London Act.

1909. From 1st January German load-line regulations equally effective with corresponding British regulations.

1909. Steamer launched to ferry trains between Sassnitz (Germany) and Trelleborg (Sweden), 65 miles (Feb.).

Control of Thames below Teddington, and of London Docks, etc., transferred to Port of London Authority as from 31st March.

British Antarctic Expedition arrived back at New Zealand (March).

Meeting of International Commission on Weather Signals in London (June).

Report of Royal Commission on Shipping Rings issued (June).

Classification of Steel Vessels adopted by Lloyd's Register (June).

Board of Trade Committee on Pilotage appointed (July).

Merchant Shipping Advisory Committee re-appointed by Board of Trade, 26th August, for two years.

New York to London *via* Fishguard, in 5 days, 1 hour, 40 minutes (August).

S.S. *Pallion*, self-discharging collier, built.

Marine Insurance (Gambling Policies) Act passed (October).

Final Report of Royal Commission on Canals and Inland Navigation issued (December).

1910. Board of Trade Committee on sight tests appointed (June).

British Antarctic Expedition left England (June).

Lloyd's Register rules for survey of marine internal combustion engines issued (June).

International Diplomatic Conference on Maritime Law at Brussels (September).

The geared turbine engine invented and fitted to the steamer *Vespasian*.

1911. Gyroscopic compass invented (January).

Pilotage Committee Report issued (March).

Reduction of Suez Canal dues 50 centimes per ton, to fcs. 6·75, from 1st January 1912, announced June.

General Dock and Railway Strikes (August).

Lloyd's Act, 1911, passed (August).

Merchant Shipping (Seamen's Allotment) Act passed (August).

Ships' Medical Scales Committee Report issued (August).

International Association of Marine Underwriters founded (November).

Maritime Conventions Act, 1911, passed (December).

National Insurance Act, 1911 (December).

1912. Loss of *Titanic*, April 15th.
London Dock Strike (May).
Report of Committee on Sight Tests issued (June).
Departmental Committee on Derelicts and Obstructions to Navigation (June).
Royal Commission on Liquid Fuel (July).
Board of Trade Committee on Boats and Davits (August).
Suez Canal dues reduced further 50 centimes, from 1st January 1913 (August).

1913. Australian Navigation Act (February).
Life-Saving Appliances, New Rules (March).
Load-Line Committee appointed (April).
Boats and Davits Committee, Final Report (June).
Volturno (s.) burnt in the Atlantic; use of oil on the rough sea helped in saving passengers and crew (October).
International Conference on Safety of Life at Sea met at the Foreign Office, London, under the Presidency of Lord Mersey (November 12).

1914. International Conference on Safety of Life at Sea drew up a Convention, consisting of 74 articles, to be signed by all interested Governments. This will standardise the conditions of safety in all the great maritime countries of the world (January 20). Text of Convention published. February 15th.

APPENDIX XIV

LIST OF MERCHANT SHIPPING ACTS

1. The Merchant Shipping Act, 1894.
2. The Merchant Shipping (Undermanning) Act, 1897.
3. The Merchant Shipping (Liability of Shipowners) Act, 1898.
4. The Merchant Shipping (Mercantile Marine Fund) Act, 1898.
5. The Mercantile Shipping (Liability of Shipowners and Others) Act, 1900.
6. The Merchant Shipping Acts Amendment Act, 1906.
   (*a*) Board of Trade Instructions to Inspectors of Ships' Dimensions under the Act of 1906.
   (*b*) Load-Line Exemption.
   (*c*) Loading of Timber Rules.
   (*d*) Language Test. Instructions to Superintendents and Consuls at Home Trade Ports.
   (*e*) Regulations relating to Ships' Names.
7. Merchant Shipping (Tonnage Deduction for Propelling Power) Act, 1907: (*a*) Board of Trade Instructions to Surveyors under above.
8. Marine Insurance (Gambling Policies) Act, 1904.
9. Merchant Shipping (Seamen Allotment) Act, 1911.
10. Merchant Shipping Act, 1911.
11. Merchant Shipping (Stevedores and Trimmers) Act, 1911.
12. Maritime Conventions Act, 1911.
13. Pilotage Act, 1913.

APPENDIX XV

Appendix P from the Board of Trade Regulations relating to the Examination of Masters and Mates in the Mercantile Marine.

TABLE SHOWING THE REQUIREMENTS AS TO SEA SERVICE NECESSARY TO QUALIFY FOR EXAMINATION FOR CERTIFICATES OF COMPETENCY.

NOTE

A candidate for an Ordinary certificate of any grade who has not previously held an Ordinary certificate of a lower grade, must prove that he has served twelve months in the foreign trade or eighteen months in the home or coasting trade in a square-rigged sailing vessel. Service in square-rigged sailing vessels.

Where Foreign-going certificates are required to be held to qualify candidates for examination, they may be either the Ordinary certificates, or those for fore-and-aft rigged vessels or for foreign-going steamships. Nature of Certificates.

It must be clearly understood that the amount of service laid down in the Regulations for each grade of certificate of competency is the absolute minimum that can be accepted, and unless a candidate can show the full amount he must in no case be allowed up for examination.

The regulations relating to examinations for engineer officers are summarized on pp. 266 and 267.

Rank	Minimum Age	Total Sea Service (Years)	Officer's Service in Merchant Vessels		
			Years	Lowest Capacity	Lowest Certificate required
ORDINARY CERTIFICATES FOR FOREIGN-GOING SHIPS					
2nd Mate	17	4	..	No officer's service required.	None.
Only Mate	19	5	..	No officer's service required.	None.
1st Mate	19	5	1	3rd or 4th Mate in foreign trade *in charge of watch.*	2nd Mate foreign-going.
				Or	
			1½	Only Mate in home or coasting trade.	2nd Mate foreign-going or home trade mate
				Or	
			1	Pilot with 1st Class pilot's certificate.	None.
Master .	21	6	1	Only Mate in foreign trade. . . .	Only Mate foreign-going.
				Or	
			1½	Only Mate in home or coasting trade.	Only Mate foreign-going.
				And in addition, unless the above service was performed with a First Mate's Foreign-going certificate, he will also be required to prove one of the following services prescribed for that grade.	
			1	3rd or 4th Mate in foreign trade *in charge of watch.*	2nd Mate foreign-going.

Rank	Minimum Age	Total Sea Service (Years)	Officer's Service in Merchant Vessels: Years	Lowest Capacity	Lowest Certificate required
				Or	
			1½	Only Mate in home or coasting trade.	2nd Mate foreign-going, or home trade Mate.
				Or	
			1	Pilot with 1st-class pilot's certificate.	None.
				OR HE MUST HAVE SERVED	
		6½	1	2nd Mate in foreign trade... (*Provided that, if this service as 2nd Mate was performed under an Additional or Auxiliary 1st Mate, it will only be accepted if a 3rd and 4th Mate were also carried.*)	1st Mate foreign-going.
				And in addition	
			1½	3rd or 4th Mate in foreign trade *in charge of watch.*	2nd Mate foreign-going.
				OR HE MUST HAVE SERVED	
		9*	3	Master in home or coasting trade.	2nd Mate foreign-going or Master home trade for one year of such service.
				Or	
			1	Master in home or coasting trade.	Do.
				And in addition	
			3	Mate in home or coasting trade.	
Extra Master .	..	..	..	Same as master . . .	..

* If all the service was in home or coasting trade.

Rank	Minimum Age	Total Sea Service (Years)	Officer's Service in Merchant Vessels: Years	Officer's Service in Merchant Vessels: Lowest Capacity	Officer's Service in Merchant Vessels: Lowest Certificate required
CERTIFICATES FOR FOREIGN-GOING FORE-AND-AFT RIGGED VESSELS					
2nd Mate Only Mate 1st Mate . Master .	Same as for ordinary certificates; except that no service in *square-rigged sailing vessels* is required.				
CERTIFICATES FOR FOREIGN-GOING STEAMSHIPS					
2nd Mate Only Mate 1st Mate Master	Same as for foreign-going ships; except that the service as officer may have been performed in a steamship and that no service in square-rigged sailing vessels is required.				
CERTIFICATES FOR HOME TRADE PASSENGER SHIPS					
Mate .	19	4	..	No officer's services required.	None.
Master .	20	5	1	Only Mate.	Mate home trade or 2nd Mate foreign-going.
				Or	
			2½	2nd Mate *in charge of watch*.	Mate, home trade, or 2nd Mate foreign-going.
				Or	
			1	As pilot with 1st class pilot's certificate.	None.

APPENDIX XVI

Two Diagrams and Explanation, Reproduced from *Fairplay* by Permission of the Editor, showing Fluctuation in Freights between 1884 and 1912.

Freight Fluctuations.

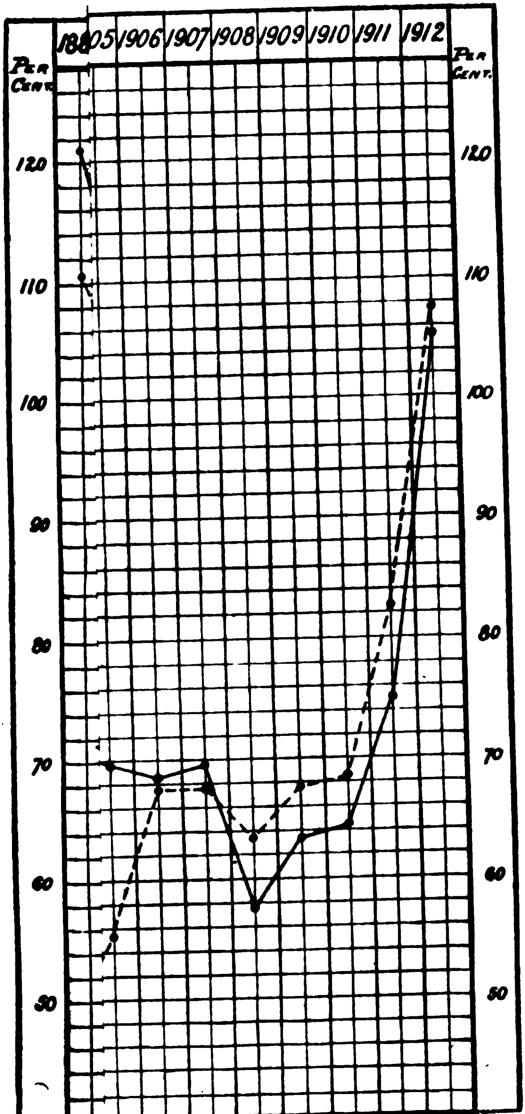
The fluctuations which have taken place in freights in different directions during the past thirty years have been enormous, as has been evidenced by the tables compiled each year by Messrs Angier Bros., and published in these columns. We have endeavoured, by the aid of these tables and the returns published by the Board of Trade from time to time, to give a diagram showing the extent of these rises. It should be mentioned, however, that averages are deceptive, and that it is impossible with the data obtainable to secure absolutely reliable figures ; but with the information at our disposal we have endeavoured to make the comparison as complete as possible. As the year 1900 is reckoned as the best year shipowners have had for many years, we have taken this year as a basis, and show by percentages the rises and falls in the years since 1884.

From this diagram it will be seen that, as regards both outward and homeward freights, 1889 was the record year, but from 1884 to 1889 freights were good and did not show any very serious fluctuation. From 1889 to 1895 freights fell to the extent of 40 per cent. The engineers' strike in 1897, by stopping the production of new shipping, together with the Spanish-American war in 1898, sent outward and homeward freights up to 91.35 per cent. of the 1900 standard, and it was solely due to the demand of the British Government for transports for South Africa that freights went up still higher in 1900, when as much as 35s. per ton gross per month was paid for the hiring of some of the large mail and passenger steamers for the transport of troops. These high figures for passenger steamers are, however, not taken into account in the table for obvious reasons. It should be borne in mind that since 1885 the size of steamers engaged in the cargo-carrying trade has increased considerably, and that vessels, owing to their increased size and better despatch, can now carry cargo at a much lower rate to leave a profit than vessels could do thirty years ago.

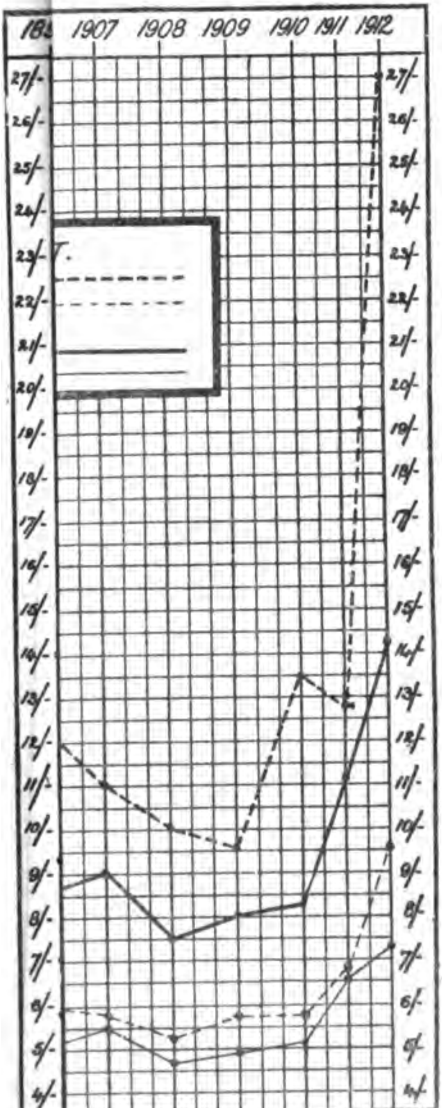
The high freights for carrying cargo that were paid in 1900, however, were not the result of an increase in trade generally, but were of a fictitious character, with the result when the transports, etc., were released by the Government, and had to seek freights in their regular trades, the result was disastrous, freights falling 26 per cent. in the following year, and remaining at an unremunerative level until September, 1911, when, shipowners having for some years refrained from building to any large extent owing to the impossibility of profitably employing tonnage, the increased trade caused the demand for steamers to more than equal the supply, with the natural consequence that freights were forced up to a paying basis. At that time it was fully anticipated by shipowners generally that they were in for a year or two of good freights, although nothing of an extra abnormal character was anticipated. The strike in the Plate caused a large number of vessels to be tied up there which were consequently taken off the market. The coal strike in this country also caused a further large amount of tonnage to be laid idle, while the transport workers' strike in the middle of the year further delayed vessels. When the disputes were over there was a glut of goods to be shifted at different parts of the world, with the result that in order to secure vessels the different markets had to increase the rates, and freights reached a point which no owner in his wildest moment had anticipated. For instance, in order to induce vessels to go to the Plate in ballast, as much as 31s. had to be paid, which was directly attributable to the strike on this side tying tonnage up. The threatened closing of the Dardanelles was the final spurt, as much as 27s. being paid to induce owners to take the risk of loading in the Black Sea. It was generally recognised that the spurt in the autumn was more or less fictitious and would not last, and therefore the fall in freights which took place a month or so ago was not altogether unexpected. The sudden drop in Black Sea rates from 27s. to 12s. caused other markets to fall in sympathy, but rates are still of a remunerative character, and it is generally believed that shipowners will have nothing to complain of for some time to come in the rates of freight they will be able to obtain.

As showing the freight fluctuations which have taken place during the period from 1892 to 1912, we give, in the appended folding sheets, further diagrams showing the highest and lowest rates in the homeward trade from Odessa and the highest and lowest rates from Wales to Genoa.

1884 TO 1912.



'eights dropped to 91.



Genoa, highest was 12s., lowest 7s.

ᴏᴍ 1850 TO 1910, SHOWING :—

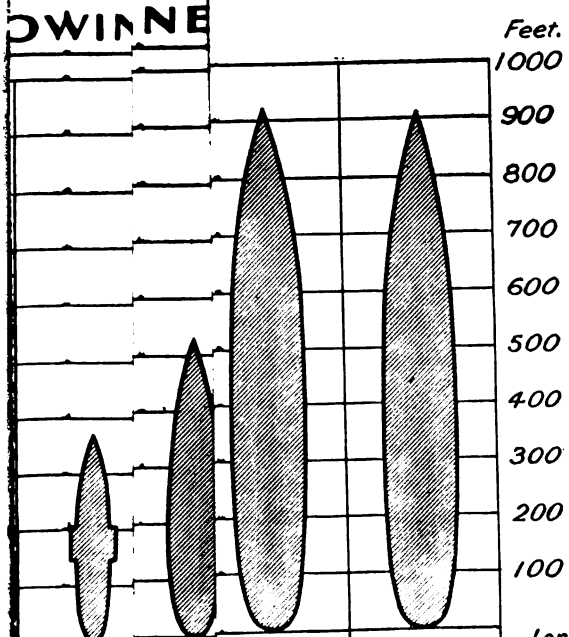
NE

tage of the World's Total.
n of steam = 4 tons sailing.

Principal Maritime Countries, Cd. 6180, 1912.)

(The to

	1900	1905	1907	1910
	096,498	1,670,766	1,461,376	1,113,944
United	207,610	9,064,816	10,023,723	10,442,719
	915,096	906,372	883,448	879,926
British	532,188	696,430	814,808	926,399
	011,594	2,577,138	2,344,824	1,993,870
British	739,798	9,761,266	10,838,531	11,369,118
	556,614	511,518	564,721	581,316
Russia	417,922	440,643	501,638	535,040
	,002,675	813,864	750,862	628,287
Norw				



376′	527′·	911′	901′	....Length between perpendiculars
45′·3″	63′·	98′	97′	....Beam.
3300	10,66	52,000.	47,000.	...Gross Tonnage
3600	18,00	61,000.	60,000.	....I. Horse Power.
13·8 Kno	19 Kn	22 Knots.	23 Knots.	....Speed per hour
150 tons per	28 tons p			....Consumption
Iron	Stee	Steel.	Steel.	....Material.
Glasgo	Glasg	Hamburg	Glasgow.	....Where built
Paddl	Twin Sc Triple Exp	Quadruple Turbines.	Turbines.	....Engines.
1855.	188	1913.	1914.	....Date.
9½ day	5 days, 2	6 days.		....Time to cross Atlantic
Persia	City of	Imperator.	Aquitania.	...Name.

GREAT BRITAIN AND THE

912.

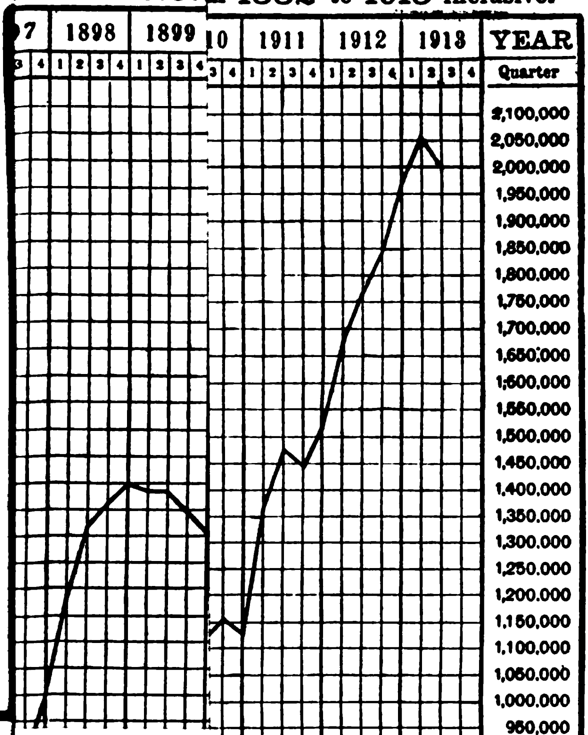
ach country.

m.)

IMPORTS A			1900		1910		1912
			£		£		£
France	51	2	79,496,109	5	85,295,754	4	91,905,234
Germany Hanove	12	4	69,724,457	3	96,110,119	3	102,468,044
Russia (1	22	8	38,344,427	7	64,559,311	9	60,484,369
Holland	16	6	46,312,113	8	58,451,873	7	68,331,672
Belgium	42	7	38,349,910	9	53,567,530	8	63,399,027
China, inc	39	16	12,016,444	16	17,957,824	16	19,811,449
Japan	66	17	11,474,451	18	15,205,737	18	16,409,087
British Settlem	11	3	75,978,627	2	116,106,158	2	142,228,981
Australia 1900)	38	5	47,346,385	6	69,648,914	6	74,400,312
New Zeal		14	17,515,173	11	30,345,216	12	31,489,404
Canada a	32	10	31,799,453	10	50,619,380	10	56,643,668
United St	61	1	176,133,216	1	182,156,504	1	201,312,770
British W	29	20	5,006,943	20	6,751,093	21	5,941,685
South Am and Pe	22	18	10,740,412	17	17,545,691	17	17,838,800
South Am Urugua	79	9	34,857,925	4	87,826,603	5	90,024,073
Central A	35	21	4,294,242	21	6,027,159	20	6,965,614
South A Hope a	64	12	17,965,201	12	29,917,339	11	33,533,119
Denmark	95	13	17,911,938	13	26,259,817	13	29,155,379
		15	17,130,283	15	19,167,246	15	20,900,249
Sweden till 189	14	19	9,667,000	19	11,206,376	19	12,953,537
Spain	37	11	22,216,203	14	19,241,986	14	22,081,623

NDIX XX

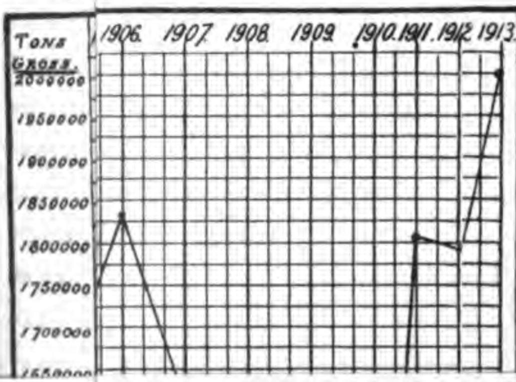
STRUCTIONm 1882 to 1913 inclusive.

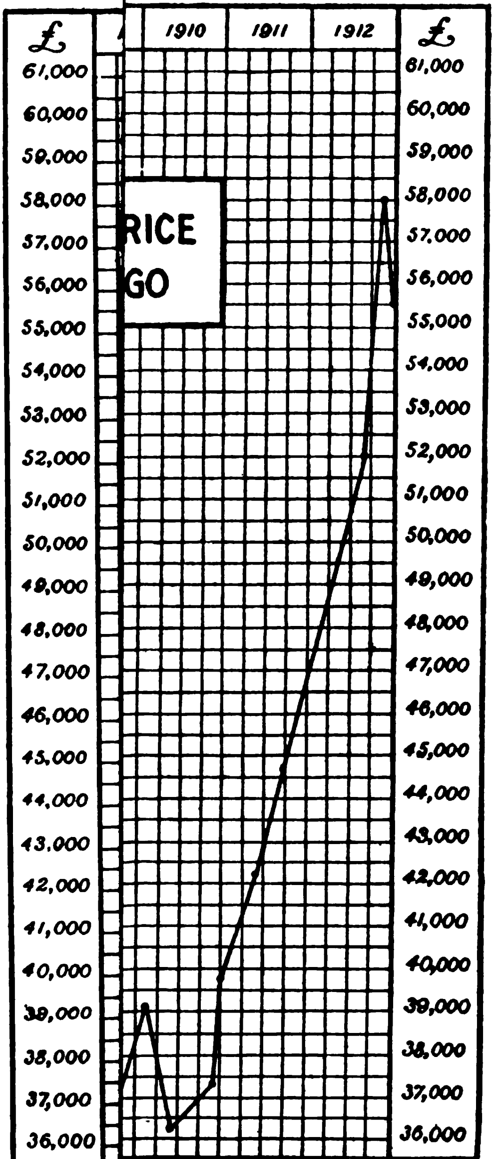


THE f‹age in the yards of the United
age and dry docks have been

1	1,159	vessels of	1,759,801	tons gross.
	1,140	,,	1,956,211	,,
	820	,,	1,706,719	,,
	745	,,	1,275,237	,,
	734	,,	1,314,218	,,
	712	,,	1,470,298	,,

OUD), from 1892 to 1913




£
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1911
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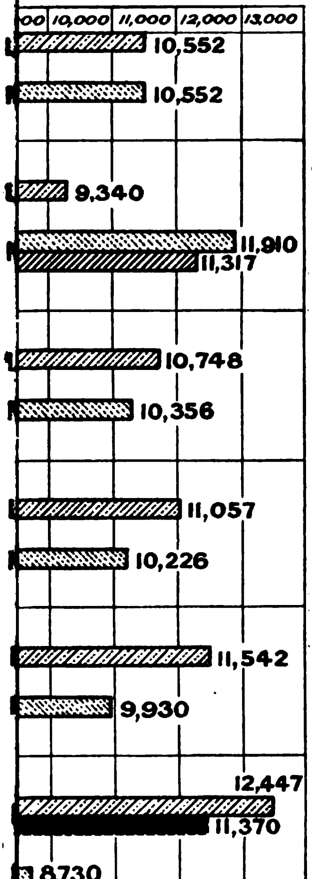
s IN THE YEAR 1912.

Fleet		Dividend Paid	Per cent-age
[o. of Ves-]sels	Tons Gross		
23	64,791	£50,625	7½
19	112,214	35,582	6·18
23	57,077	27,489	8
37	105,086	41,500	7·54
40	107,784	32,500	5
08	458,619	106,790	6·44
27	117,476	*nil*	—
19	118,895	50,208	9·87
53	223,019	30,000	6
26	267,017	96,001	6
30	91,083	25,000	5
87	355,791	98,000	7
8	36,062	*nil*	—
6	28,124	*nil*	—
38	90,428	14,877	3
41	251,155	*nil*	—
2	16,005	*nil*	—
24	164,149	69,638	10
43	425,579	450,000	60
9	97,390	73,875	23·13
35	167,826	88,627	6
89	447,391	291,000	8·31
38	142,275	60,149	10
59	237,502	85,000	5
84	4,182,828	£1,726,861	7·79
20	1,067,425	*nil*	—

ama Route.



00
10,000
11,000
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10,552
9,340
11,910
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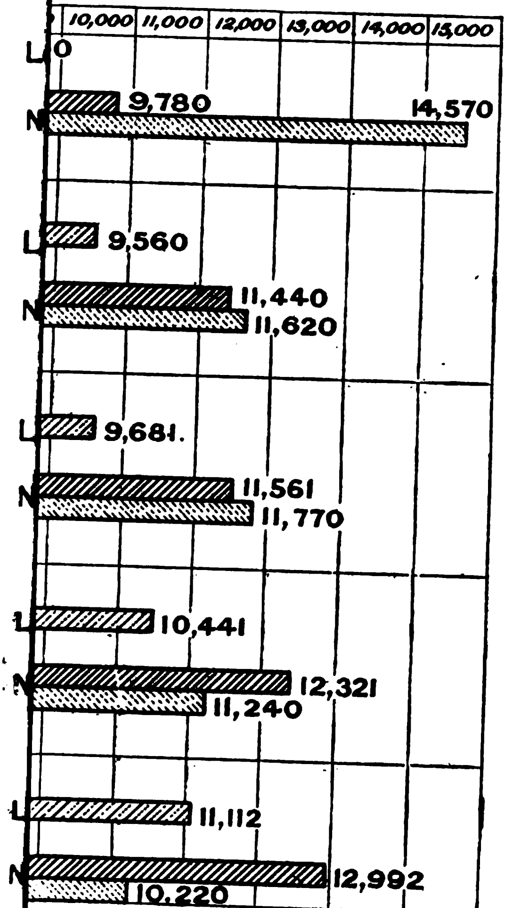
11,542
9,930
12,447
11,370
8,730

Panama Route.



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